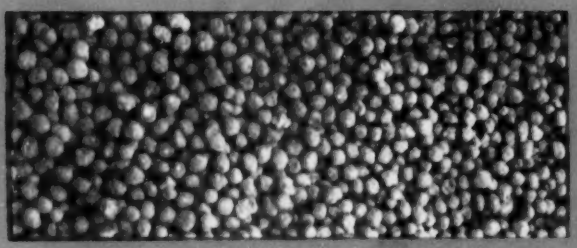
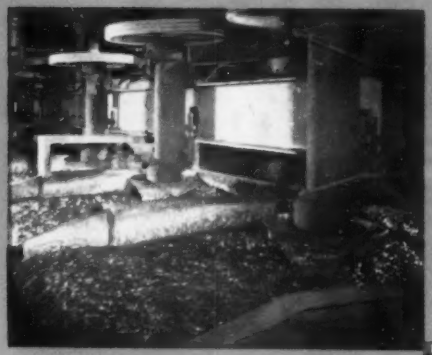
MINING WORLD

February
1960

IRON ORE

. . . producers compete for markets p. 44





THREE WAY SEPARATION

. . . of copper, lead and zinc by flotation p. 30

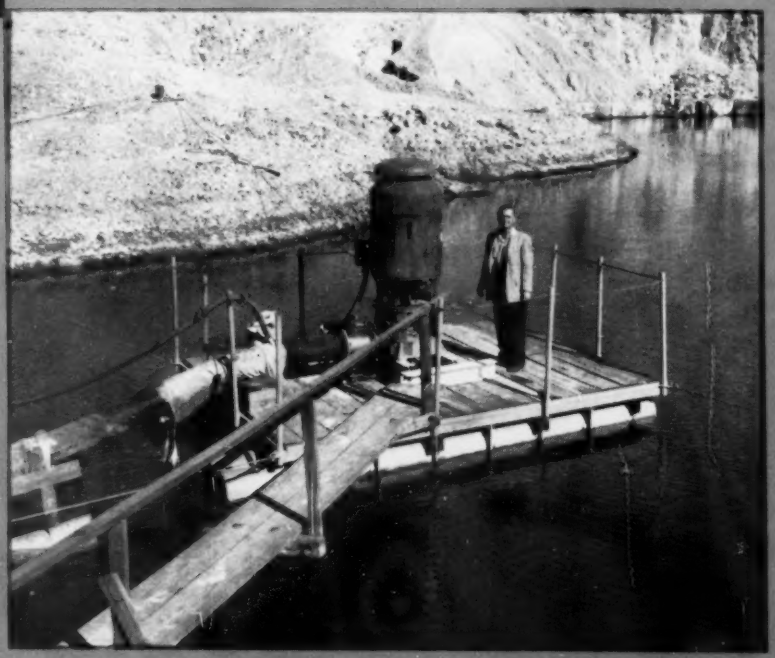
PLASTICS AT MIAMI

. . . for corrosion problems p. 41

Also

Union Miniere's Plans For Congo Development p. 34

New Copper Development Is Announced for Chile p. 29



"Imagination... is the source of human improvement; experience its implement"

The giant new Copper Smelter of Kennecott Copper Corporation, Hayden, Arizona; designed, engineered and built by WKE.

MINERAL ENGINEERING: MAKING THE MOST OF THE EARTH'S RICHES

The measure of civilization's progress, through the ages, has been man's capacity to produce and put the earth's minerals to work for him.

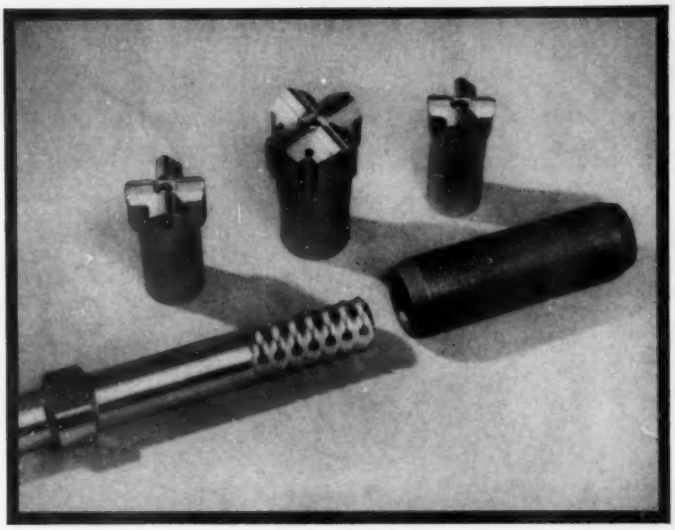
Today, mineral engineering is a highly developed art based on knowledge and integration of techniques, processes, equipment—and economic feasibility; thus WKE's position of pre-eminence in the field. WKE experience covers virtually every economically significant mineral and metal. For example: selenium to iron ore; uranium to aggregate; 10 of the 25 U. S. uranium plants; 22 iron ore plants; 2 of the 3 recently completed copper smelters in the United States.

WKE's world-wide mineral engineering service can help you get more from a mineral deposit, from planning and execution of exploration drilling, test work and feasibility studies, through design and construction of mine, mine facilities and process plant.

We'll be happy to provide detailed facts on WKE's Mineral Engineering Services plus specific information on minerals or metals.

WKE®

WESTERN-KNAPP ENGINEERING CO.
SAN FRANCISCO • New York • Chicago • Hibbing
Building for the Future—in a World of Industries



Here's proof Coromant rope-thread bits and steels SAVE TIME AND MONEY

"Up to double the footage between sharpenings!"
"Premature rod breakage is almost non-existent!"
"40% more usable life—more resharpenings!"
"Bit and rod life are well above average!"
"Uncouple by hand all the time!"
"More rigid—drills straighter holes!"*

**Names of men quoted available on request*

The comments above are actual quotes from project managers, job superintendents, and drill superintendents who have tested new Coromant rope-thread bits and steels. They've learned, on-the-job, the benefits they—and you—can expect!

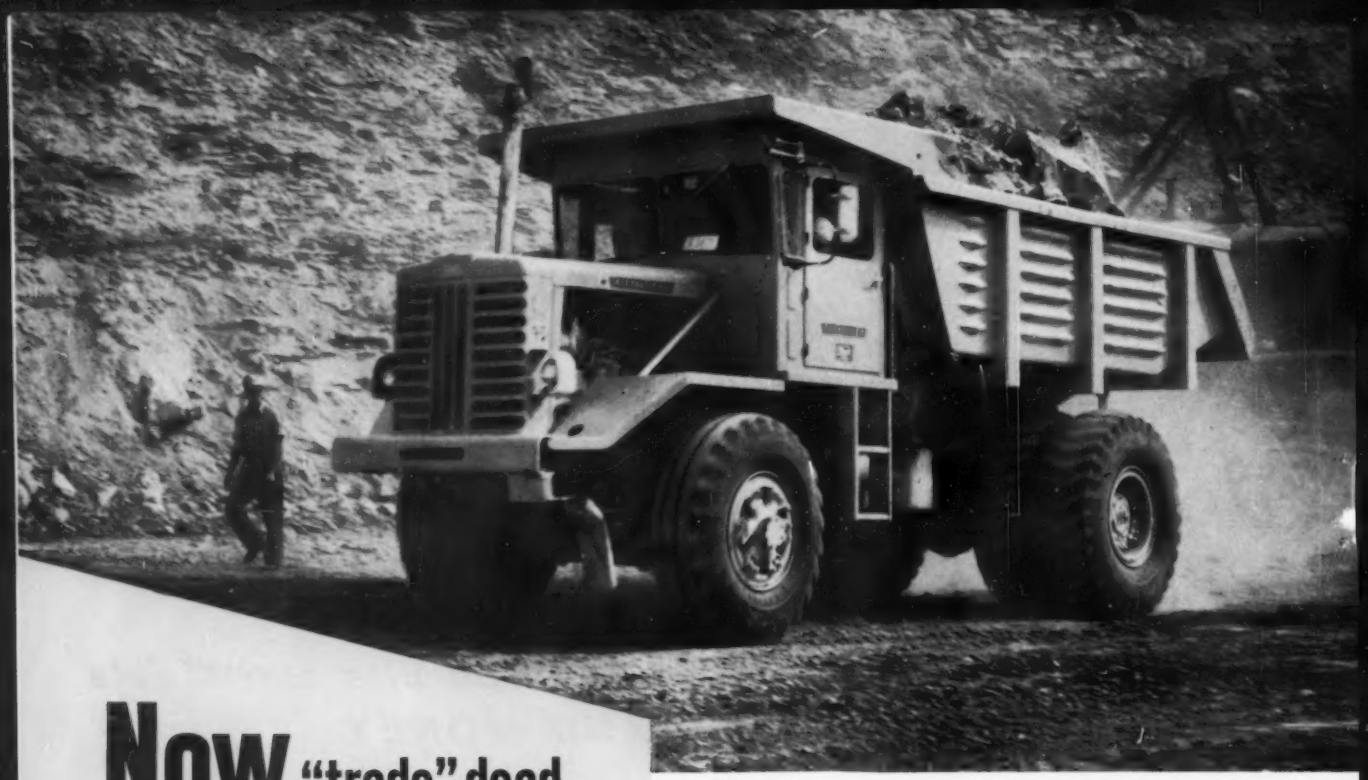
For example: The new rope-thread (only two turns per inch) holds tight in use, yet permits hand uncoupling. Reports show that the time saved results in more footage drilled per shift. Bit footage is well above average too, with less loss of carbide inserts. Prime quality ore plus nickel-chrome alloy permits cold-rolling from billets for greater strength, life and rigidity. And only with Coromant rope-thread steels can you re-thread without heat treating, too. Do it yourself, or at any nearby machine shop.

Want to know more? There's no obligation on your part, but we'll be glad to help where we can. Just call your nearest Atlas Copco Office, or write to us at Dept. MW-7.

Atlas Copco

610 Industrial Avenue
Paramus, New Jersey
COlfax 1-6800

930 Brittan Avenue
San Carlos, California
LYtell 1-0375



Now "trade" dead weight for payload..and haul 40% faster!

Heap-load the big-target Payhauler body in minimum time. Strong rock-ribbed corrugations absorb shock—resist wear and distortion. Choose the "95" with power-shift Torque-Converter, or 9-speed air-shift transmission.

New strength-multiplying corrugated body design results in payload-gaining weight reduction of both International Payhauler models. New "95" capacity is increased to 27 tons—and the new "65" becomes the only 19-tonner on the market!

Look at those exclusive, rock-ribbed body corrugations! International applies this strength-multiplying principle to reduce Payhauler® body weight by an amazing 30%! You "trade" 2½ tons of power-wasting dead weight for 3 bonus tons of payload capacity in the new 95 Payhauler!

New high-torque, high-output diesel power high-balls 27-ton payloads up to 40% faster than the former "95" could haul only 24 tons! The new 375 hp DT-817 International diesel engine gives the new 95 Payhauler the wallop of 40 extra turbocharged "horses."

Prove to yourself that top load-carrying capacity plus top power-to-weight ratio give 95 Payhaulers tremendous profit-earning advantages. Add up other big Payhauler exclusives: fast reverse, up to 7.1 mph. for spotting speed; big-target bodies for loading zip; 11-second inverted-hoist dumping; load speeding safety of torqmatic braking and positive power-steering! Let your International Construction Equipment Distributor demonstrate!

International® Construction Equipment

International Harvester Co., 180 N. Michigan Ave., Chicago 1

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers and Bottom-Dump Wagons . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

MINING WORLD

. . . . . including the Export Edition, WORLD MINING

VOL. 22 NO. 2 February 1960

New Montana Gold Mill has been started by Northern Milling Company at its Marietta mine near Townsend. High arsenic content of ore and concentrates has long been problem, but new mill now makes low-arsenic concentrate with no smelter penalty 29

Idarado Makes Difficult flotation separation of copper, lead, and zinc at its Pandora mill, Telluride, Colorado, using 13 different flotation reagents. Five metals are recovered in four separate concentrates 30

United States Mining Equipment plays important part at the open pit mines of Union Minière du Haut Katanga in the Belgian Congo. Geology of these deposits and metallurgy of ores are also discussed by special Mining World correspondent 34

Aligrab Shaft Mucking used at Kiruna, Sweden to sink small shaft. Only two men, the Aligrab operator and hoistman, are needed. Loading efficiency in first shaft was 11 tons per man hour 38

Plastics Beat Corrosion at Miami Copper Company, Paraline PVC pipe used to make raft which will float indefinitely in Copper Cities' acid water. Plastic coated metal parts have long life in non-abrasive service 41

Lake Superior iron mining companies are spending time, money, and energy to make their ores more competitive in this time of iron over-supply on a world-wide basis is report at Minnesota Mining Symposium. Foreign competition is here to stay, but the Iron Ranges are doing many things to make their ore more sought after by the steel furnaces 45

Production Equipment Preview shows new tandem scraper system, new self priming sump pump, a new shovel attachment for a motor grader, and a positive beryllium mineral detector 46

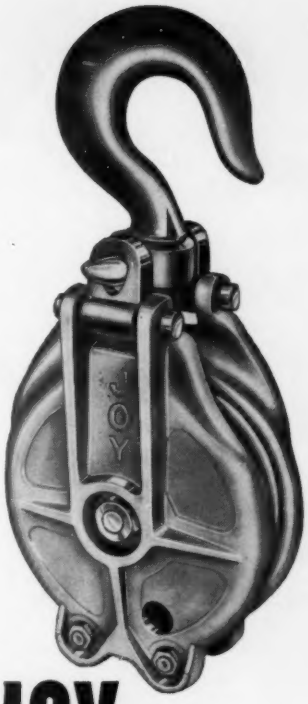
WHAT'S GOING ON IN MINING

Central-Eastern 57
Iron Ranges 58
Northwest 59
Rocky Mountain 61
Southwest 62
International 68

DEPARTMENTS

Drifts and Crosscuts 5
Capitol Concentrates 9
Money Making Methods 40
Production Equipment Preview 46
Men Who Make News In U. S. 53
Metal and Mineral Prices . . . 56
Advertisers Index 80

mf MILLER FREEMAN PUBLICATIONS



JOY quick opening
SHEAVE BLOCKS

forged construction

The hook and side plates of the 6″, 8″ and 10″ sizes are *forged alloy steel*. The wheel is chrome-nickel-moly cast steel. All parts are heat-treated for strength and wear resistance.

simple & rugged

There are no pins, chains, bolts or nuts to handle or remove. TO OPEN JUST TURN AND PUSH . . . no parts leave the block to become lost. The rugged opening mechanism will last for the life of the block.

Write for Bulletin 287-B

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

MINING WORLD, February, 1960. Volume 22, No. 2. Published monthly except April, when publication is semi-monthly at Emmett St., Bristol, Conn. Executive, advertising and editorial offices, 500 Howard Street, San Francisco 5, California. Subscription in United States, North, Central and South America, $4.00 per year; other countries, $5.00 per year. Entered as second class matter Oct. 10, 1951 at the Post Office at Bristol, Conn., under act of March 3, 1879. Postmaster: please send notice 3579 to MINING WORLD, 500 Howard Street, San Francisco 5, Calif.

This Lima Type 1250 equals output of more expensive competitive shovel at W. Va. mine site.

Lima outperforms

says Paul Carapellotti, Mgr.
Huberta Coal Co., Steubenville, Ohio

"We tested our first Lima by working it next to a competitive machine. The Lima proved superior. It did more work with less maintenance. We now own five Limas—a 1201, two 2400's, a 1250 and a recently purchased 802 Lima Coal Loader with 3-yd. dipper.

"The 1250 is small enough to be very mobile; big enough to handle its own stripping and loading as dragline or shovel. It does as much work as a heavier rated competitive rig costing considerably more."—*Paul Carapellotti, Mgr., Huberta Coal Co., Steubenville, Ohio.*

Lima's are better built and better engineered for dependable high production, trouble-free operation. They are favored by mine operators because they outdig, outstrip and outlast other makes.

There's a Lima type and size for every mining job. Shovels to 8 yd., draglines variable; choice of gasoline, Diesel or electric power; crawler, truck or wagon mounting. Ask for facts. See your nearby Lima distributor. Or write Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

Speed handling of bulk materials with this new 5-yd. Lima Loader. Converts to shovel, dragline, pullshovel or crane. Investigate!

DISTRIBUTORS IN PRINCIPAL CITIES OF THE WORLD

Cable Address: LIMASHOVEL, Lima, Ohio, U.S.A.

LIMA Construction Equipment Division, Lima, Ohio

BALDWIN · LIMA · HAMILTON

6012

Shovels • Cranes • Draglines • Pullshovels • Roadpackers • Crushing, Screening and Washing Equipment

MINING WORLD

EDITORIAL AND EXECUTIVE OFFICES
500 Howard Street
San Francisco 5, California
EXbrook 7-1881

General Manager ..... Max F. Holsinger
Editor ..... George O. Argall, Jr.
Associate Editor ..... Stanley Dayton
Mgr., Engr. Services ..... H. G. Grundstedt
News Editor ..... Janet M. Taylor
Assistant News Editor ..... L. B. Robinson
Product Editor ..... Suzanne Matsen
Production Manager ... Charlotte E. Smith
Asst. Production Mgr. .... Jeannette Harris
Circulation Manager ..... C. C. Baake
Field Circulation Mgr. ..... C. S. Denny

New York City Office
370 Lexington Aveue
New York 17, New York
Murray Hill 3-9295
District Manager ..... A. E. Roberts

Chicago Office
1791 Howard Street
Chicago 26, Illinois
Rogers Park 4-3420
District Manager ..... Norman C. Ek

Vancouver, B. C. Office
402 Pender St. West
Vancouver, British Columbia, Canada
MUtual 5-7287
Cable Address: MILFREEPUB
Associate Editor ..... Charles L. Shaw

Vice President International Operations
Miller Freeman Publications .....
Max F. Holsinger

United Kingdom Office
130 Crawford Street
(Corner Baker Street)
London, W. 1, England
WElbeck 3624
Cable Address: MILFREEPUB
Manager, United Kingdom Office .....
Bernard W. Lansdowne

Continental European Office
28 Attendorner Street
Köln-Merheim
West Germany
Telephone: 87-17-52
Cable Address: MILFREEPUB
Director, Continental European Operations
Dr. Walter F. Vogeno

STAFF CORRESPONDENTS: Africa—Johannesburg, Union of South Africa; Salisbury, Southern Rhodesia; Luanshya, Northern Rhodesia; Kampala, Uganda. Asia—Ankara, Turkey; Kuala Lumpur, Malaya; Bombay, India; Tavoy, Burma; Karachi, Pakistan; Seoul, Republic of Korea; Tokyo, Japan. Europe—London and Redruth, England; Vienna, Austria; Stockholm, Sweden; Trondheim, Norway; Paris, France; Madrid, Spain; Köln-Kalk (Cologne), West Germany; Rome, Italy. North and Central America—Vancouver, British Columbia; Mexico, D.F., Mexico. Oceania—Port Kembla, Australia; Manila, Republic of the Philippines; Bandung, Indonesia. South America—Lima, Peru; La Paz, Bolivia; Buenos Aires, Argentina; Santiago, Chile; La Serena, Chile.

Not responsible for unsolicited manuscripts. Contents may not be reproduced without permission.

Published by American Trade Journals, Inc.
Wm. B. Freeman, President
Miller Freeman, Jr., Exec. Vice-President & Treas.
Max F. Holsinger, Vice-Pres.

SUBSCRIPTION RATES:
U.S., North, South and Central America $4.00
Other Countries $5.00
Single Copies .....$ .50
Directory Number $1.00

CHANGE OF ADDRESS:
Send subscription orders and changes of address to MINING WORLD, 500 Howard St., San Francisco 5, Calif. Include both old and new addresses and zone numbers.

Copyright 1960 by American Trade Journals, Inc.

Good Luck Lucky Mc

Gone from the mining scene will be Lucky Mc Uranium Corporation as the firm's board of directors has voted for the Utah Construction and Mining Corporation to completely absorb Lucky Mc.

Gone, but not soon forgotten in the mining world, will be Lucky Mc and the men who made it. Their successes in the truest tradition of opportunities in the United States will always be the inspiration to other prospectors and developers. Let Lucky Mc die, but these men won't let the spirit, courage, and determination die that built Lucky Mc into a profitable operation. So profitable that the largest stockholder, manager, and operator absorbed Lucky Mc. That's been the story of uranium, and other small companies too. It's part of the times and the trend.

These Lucky Mc men include Neil McNeice, a garage mechanic and part time prospector, who first discovered ore in Wyoming's Gas Hills. He found more than the Lucky Mc mine—he found a mining district—where more experienced men said nothing existed. Partner Lowell Marfeld was ever present with his support during those earliest and most difficult days. W. H. H. (Harry) Cranmer, Utah mine maker, was the first to realize the true potential of Neil McNeice's discovery and furnished early capital for exploration and mining. Yet another man of Lucky Mc is Allen Christensen, last president, who brought Utah Construction's vast organization into Lucky Mc to explore, drill, strip, negotiate an AEC contract, build a mill, and mine the ore.

These are the men of Lucky Mc, discoverers, mine maker, and financier-operator. The mining world needs more of that type.

Good luck to these key men of Lucky Mc, and all their assistants who wrote such an important page in mining history.

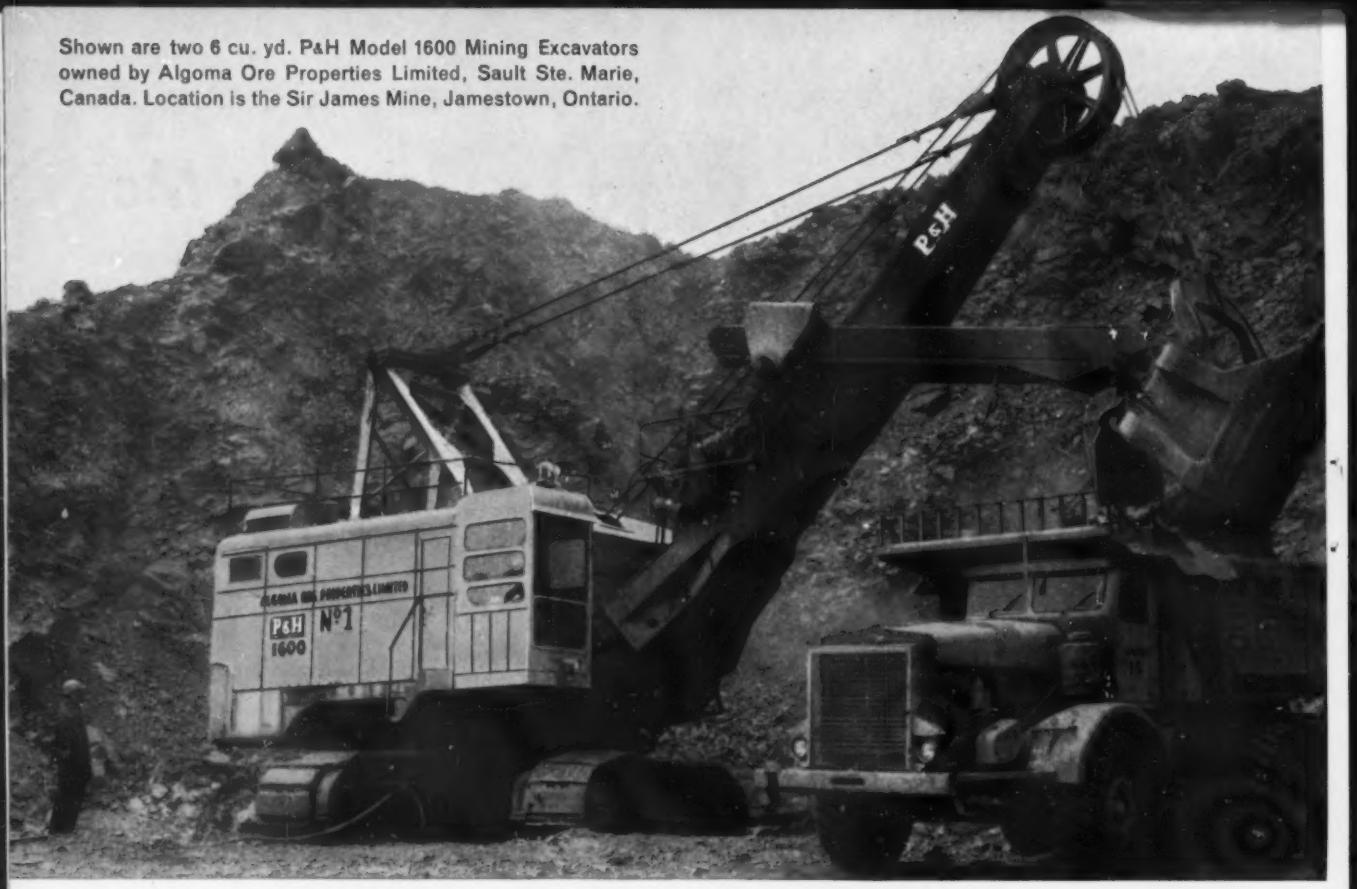
Big Job Well Done

The U. S. Bureau of Mines staff has just completed a monumental task. That is the compilation and publication of six annual *Minerals' Yearbooks* in three and one-half years. The 2,779-page, 1958, volume was published in December 1959 to bring the series up to date for the first time since 1941. Work is already well under way on the 1959 issue for publication this year.

MINING WORLD is proud of its small contribution to this accomplishment. That was the relaying of industry needs and wishes for current Mineral Yearbooks to Marling J. Ankeny soon after he became Director of the Bureau in July 1956.

The mining industry extends thanks and congratulations to the Director and staff for efficiently overcoming the publications lag brought on by more urgent assignments during two world wars.

Shown are two 6 cu. yd. P&H Model 1600 Mining Excavators owned by Algoma Ore Properties Limited, Sault Ste. Marie, Canada. Location is the Sir James Mine, Jamestown, Ontario.



AT ALGOMA ORE PROPERTIES,

LTD.

One P&H always sells another because...

P&H "PROFIT·TONS" reduce loading costs in hardest digging

Up to 30% higher bail pull for more uniform dipper speed in the pile—faster swing—exceptional physical strength of P&H welded construction—greater job availability all add up to as much as 10% more production, lower loading cost per ton and *more net profit* for owners of P&H Electric Mining Excavators on their hardest digging assignment.

P&H "Profit-Tons" are the end product of these *exclusive* P&H design principles:

MAGNETORQUE® . . . the most productive digging motion drive known for electric excavators. This patented P&H hoist drive electro-magnetically transmits the full digging power of an A.C. hoist motor direct to the dipper *without motor generator set conversion to D.C. current.* It gives higher bail pull, greater dipper fill factor and automatic impact protection to the digging machinery.

ELECTRONIC CONTROL . . . this patented P&H control accomplishes the quickest work motion reaction time known on electric shovels. Control maintenance expense is reduced as much as 80% by elimination of all moving parts for a completely closed circuit system.

In addition, with P&H—and only with P&H—do you get the service assurance of single source responsibility. P&H manufactures their own electrical as well as mechanical components—*designed specifically for electric excavator service.* Write Dept. 607A, Harnischfeger Corporation, Milwaukee 46, Wisconsin.

HARNISCHFEGER P&H

Milwaukee 46, Wisconsin

P&H LINE:
Electric Excavators: 3¼ through 10 yds.
Diesel Excavators: ¼ through 3½ yds.
Truck Cranes: 10 through 80 tons

P&H equipment is also manufactured in Australia, Brazil, Canada, Germany and Japan.

KNAPSACK-FERROSILICON 15% ATOMIZED

FOR HEAVY MEDIA SEPARATION

Helps reduce costs and increases operating efficiency by:

1. **Reducing corrosion**

   The spherical shaped particles of atomized ferrosilicon offer maximum resistance to corrosion due to their smooth, hard surface. There are no sharp-edged corners which are particularly susceptible to rusting.

2. **Reducing „drag-out" or adhesion losses**

   Atomized ferrosilicon particles are easily separated from the ore and gangue by spraying on the rinsing screens, eliminating high losses due to adhesion.

3. **Reducing pulp viscosity**

   The ball-to-ball contact of the atomized ferrosilicon particles minimizes mutual adhesion, reducing the pulp viscosity.

   Because of the reduced pulp viscosity, the feed can be increased to give a more dense pulp for sharper separations. Specific gravities up to 3.9 are attainable.

4. **Reducing wear on equipment**

   Atomized ferrosilicon, due to its rounded surface, materially reduces wear on pumps, piping, etc.

KNAPSACK-GRIESHEIM

AKTIENGESELLSCHAFT

WERK KNAPSACK · KNAPSACK BEI KÖLN

HOECHST

U. S. DISTRIBUTORS:

HOSTACHEM CORPORATION

350 FIFTH AVE., N. Y. 1, N. Y.

CAPITOL CONCENTRATES

Commission For Gold Study Requested

Senator Frank Church of Idaho has urged the Senate Interior and Insular Affairs Committee to schedule early action on legislation designed to revive the gold mining industry. He requested Senator James E. Murray, chairman of the committee, to schedule early consideration of a Senate Concurrent Resolution which would create a commission to study the industry and recommend legislation.

Such a commission, Church explained, would be empowered to hold hearings, and make a full and complete study of the gold mining industry in the United States. The results of this study would be reported to the two Houses of Congress, with recommendations for the necessary legislation to establish the production of gold as an integral part of the economy of the country.

"Such a study needs to be made," Church wrote Murray, "and the commission which you have proposed would be an ideal vehicle for undertaking it. Bipartisan representation from each House, and from industry, would provide a broadly-based membership for a definitive study and report. I hope that this resolution can be considered by our committee and reported early in 1960."

Early Hearings On Wilderness Bill

Proponents of the wilderness bill are pressing for consideration of the measure by the Senate Interior Committee in the hope that action by both Houses of Congress will be completed at the 1960 session. Senator Murray, chairman of the committee, has said that the bill would be "at the top of the committee's agenda when Congress met."

Organizations representing mining, cattle, and lumber associations are reminding their members that they should let their Senators and Representatives know how they stand on this legislation. It is also suggested that the members of Congress be reminded that in 1959 the legislatures of Arizona, California, Colorado, Idaho, New Mexico, Nevada, Utah, and Washington memorialized Congress against enactment of any blanket wilderness bill.

From present indications, a real battle lies ahead if this measure is to be defeated.

Tariff Commission Fluorspar Hearing

A two-day hearing was conducted in December by the United States Tariff Commission as a part of a general investigation of the domestic fluorspar industry. The study, designed to up-date background data on the industry as a basis for possible legislation, was ordered last summer by the United States Senate.

One fluorspar operator—Robert Frazer, president, Kentucky Fluorspar Company—asked for an import tariff of $7 50 per ton on metallurgical-grade spar and $15.00 per ton on acid-grade spar. These rates, he said, would allow the domestic industry a fair profit on its operations. Another operator—C. O. Anderson, president, Ozark-Mahoning Company—while not naming a specific price, stated that some way must be found to guarantee domestic fluorspar producers a price level high enough to permit them to compete with imports anywhere in the country. The fluorspar industry in the United States, he said, is not a large industry, "but it is an extremely vital one, being substantially the spark plug of a number of the largest and most important industries in our economy, whether our country is at peace or at war."

Lead-Zinc Quotas Will Be Continued

A statement has been released from the White House indicating that lead-zinc quotas will remain in effect until "conditions in the distressed segments of the lead and zinc mining industries have shown substantial improvement." Considering the pressure put on the White House from abroad (and even from domestic companies) for revoking these quotas, this statement is encouraging. Of course, what constitutes substantial improvement is a matter of opinion; but judging from the cut in the lead price to 12 cents per pound, "substantial improvement" does not seem to be just around the corner.

Report Recommends Lead-Zinc Subsidies

The Senate Foreign Relations Committee would solve the lead-zinc problem by substituting subsidies for quotas. A recommendation to that effect is contained in a report on "Commodity Problems in Latin America" issued by the committee and prepared for it by International Economic Consultants, Inc., a Washington, D. C., firm.

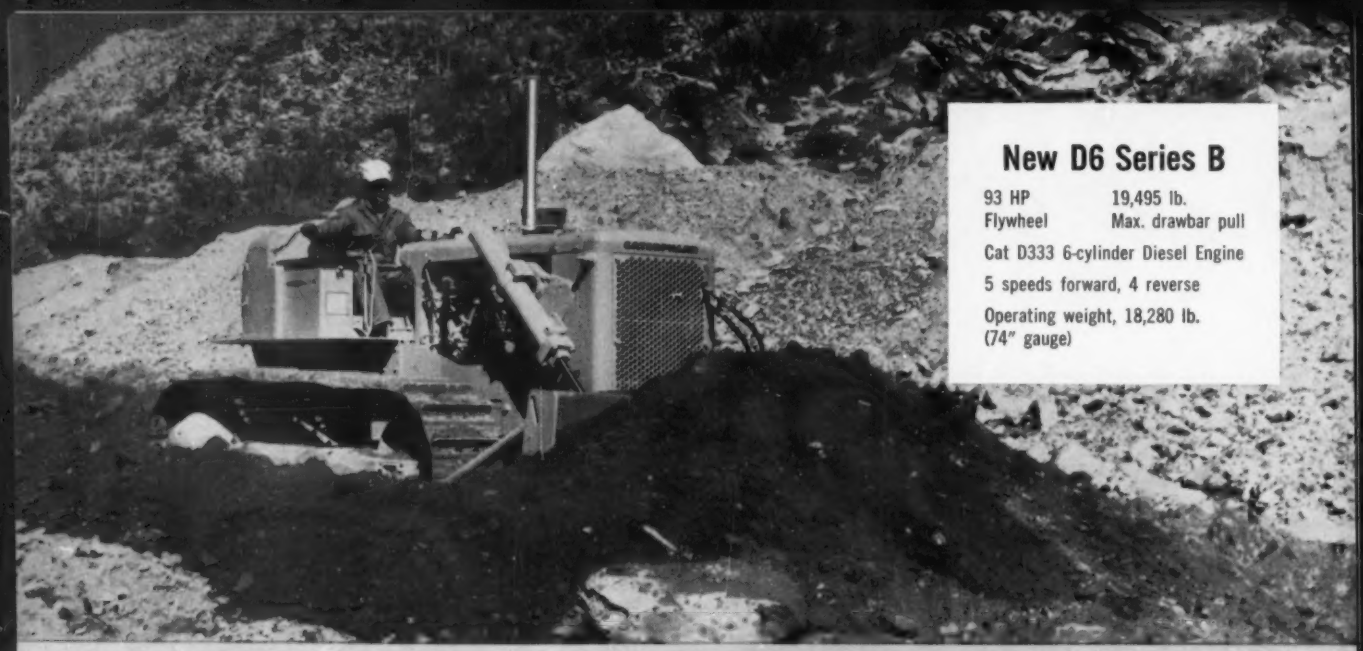
The report is one of a series on Latin American relationships and problems authorized by a Senate resolution which provided $150,000 for that purpose. Its authors maintain that continued tariff concessions are necessary in the area of basic commodities if the United States is to help Latin America meet its economic problems.

A reconsideration of quotas now in effect on lead, zinc, and petroleum is recommended. In their place, the report favors a movement "toward free markets for minerals, using subsidies when necessary to maintain essential domestic production." The so-called Seaton plan, it says, would be preferable to quotas "if national policy considerations make it desirable to insure marginal domestic producers against undue hardships."

Mineral Survey Plan Is Dropped

The government has dropped, for the present, the annual survey of the minerals industries proposed earlier in the year by the Bureau of the Census and the U. S. Bureau of Mines. In its place a dractically simplified scheme will be substituted—the asking of a few additional questions in conjunction with reports regularly filed on a voluntary basis with the U. S. Bureau of Mines.

The original survey proposal had been strongly opposed by Senator Murray, chairman of the Senate Interior Committee, who charged that it duplicated existing reports, placed an undue burden upon industry, and called for costly outlays by mining companies.



New D6 Series B

93 HP Flywheel — 19,495 lb. Max. drawbar pull

Cat D333 6-cylinder Diesel Engine

5 speeds forward, 4 reverse

Operating weight, 18,280 lb. (74″ gauge)

RUGGED MATCHED ATTACHMENTS for the D6 and D4 include Bulldozers, Tool Bar, Scraper, Rock Rakes, Winches, K/G Blade, Rippers and others.

New D4 Series C

65 HP Flywheel — 13,000 lb. Max. drawbar pull

Cat D330 4-cylinder Diesel Engine

5 speeds forward, 4 reverse

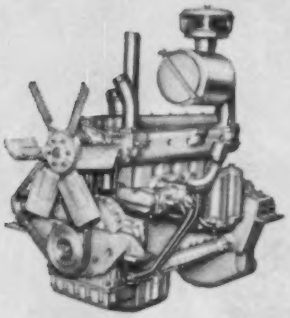
Operating weight, 11,710 lb. (60″ gauge)

IMPROVED STARTING ENGINE for both tractors has recoil starter for fast starts. Also 12-volt in-seat starting available. 24-volt direct electric starting optional.

CATERPILLAR ANNOUNCES the

completely redesigned for faster and greater production

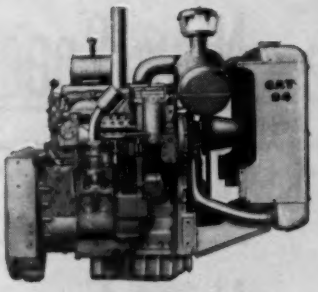
There's no time like now to upgrade your equipment spread. These two new tractors not only look different—they are different. Each, in its own class, answers your needs for higher production and greater operating economy. Some of their important new features are described on these pages. In addition to these improvements, each machine provides other famous Caterpillar features... the dry-type air cleaner,



D6 93 HP 6-cylinder Engine
Maximum drawbar pull, 19,495 lb. The D333 Engine provides power with dependability for a long life of economical operation.

New Caterpillar Diesel Engines deliver 25% more lugging ability

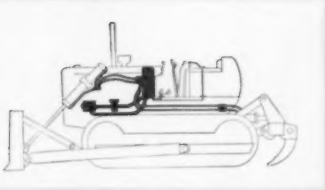
For the D6 and D4, two completely new Cat Diesel Engines. 25% more lugging ability. New compactness with new ruggedness. Famous Cat fuel injection pumps in new, easily serviceable housing. New direct acting governor that makes quick fuel adjustments, picks up loads fast. New, improved gasoline starting engine.



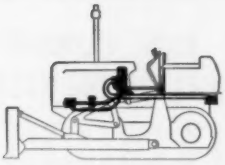
D4 65 HP 4-cylinder Engine
Maximum drawbar pull, 13,000 lb. New design of the D330 results in smooth, vibration-free performance in all speed ranges.

New integral hydraulic systems put more power where you need it

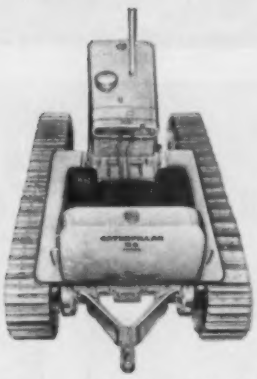
More work power at the tools—that's one of the big advantages of these new Cat hydraulic systems. Under-the-hood mounting of tank, pump and valves permits convenient routing of hydraulic lines to bulldozer or implement cylinders, frees front and rear for mounted equipment. Center-pivoted cylinder mounting on D6 gives increased blade lift/drop range for greater production. Hydraulic control system provides hand control for bulldozer and/or ripper, foot control for tilt cylinder on D6.



D6 Integral Hydraulic System
No. 165 Hydraulic Control for bulldozer
54 GPM Pump—1500 PSI
No. 143 Hydraulic Control for No. 6 Tool Bar
29 GPM Pump—1700 PSI



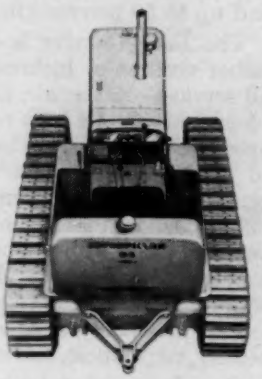
D4 Integral Hydraulic System
No. 143 Hydraulic Control with:
29 GPM Pump—1700 PSI for bulldozers
17 GPM Pump—1700 PSI for tool bars



D6 operator's compartment

New operator convenience and comfort in co-ordinated compartments

The cockpits are all new. Controls are co-ordinated to make one motion flow into the next, reducing hand movements and speeding every operation. Forward-reverse lever (new on the D4) is next to the operator's right hand to speed 'dozer cycle times. Short-travel transmission speed selector shifts gears easily, quickly. Boosters for steering clutches save muscles . . . increase efficiency.



D4 operator's compartment

New D4 Series C and D6 Series B Tractors

hydraulic track adjusters, lifetime lubricated track rollers, the oil clutch, the forward-reverse lever. Your Caterpillar Dealer will be happy to give you the complete facts about both the new D6 and the new D4 and demonstrate them on any of your jobs. The tougher, the better.

Caterpillar Tractor Co., General Offices, Peoria, Illinois, U. S. A.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

BORN OF RESEARCH
PROVED IN THE FIELD

New Speed
New Safety
New Economy

ALIMAK

RAISE-CLIMBER* ELEVATING SYSTEM

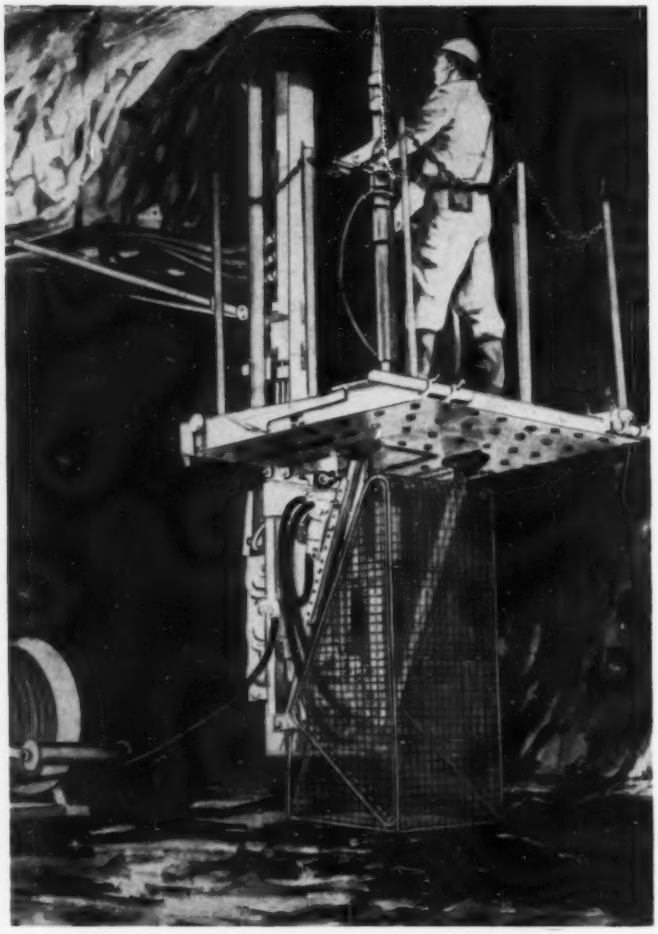
Profit moves up when management cuts into drill-blast cycle expense with ALIMAK's *Raise-Climber Elevating System.* Now, one man can carry out a full range of operations, with maximum safety, at the face of the raise—up to 50 percent faster, and up to 50 percent cheaper.

The *Raise-Climber* is equally efficient in either vertical or inclined raises, providing all services—water, air, electricity and telephone, housed in the rack itself – at the operator's finger-tips. The operator is raised to the working face where he drills for charges. After descending, the platform is folded back for blasting, high-pressure clean-out and ventilating. Operating records in over one hundred world-wide mining installations, including twenty in Canada, attest to the *Raise-Climber's* remarkable versatility, ruggedness, and simplicity of design.

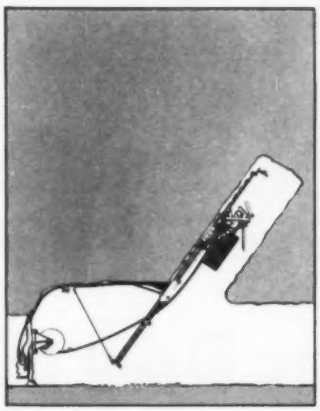
Complete sales and service representation available throughout the United States. Write or wire for full details, today.

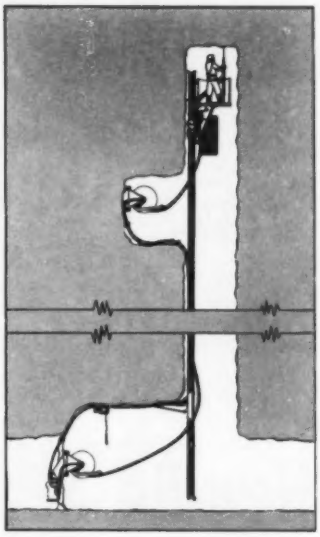
*Patent Pending

for driving raises from 40 feet up to 1200 feet and more



Additional 3 ft. or 6 ft. sections are quickly and safely installed from platform. Costly staging and re-staging is eliminated. On raises over 600 ft. added hose reel is installed in niche.





ALIMAK

RAISE-CLIMBER ELEVATING SYSTEM

Alimak Corporation

306 Avila St., San Francisco 23, California
A Subsidiary of Alimak-Verken AB
Skelleftea, Sweden

A Product of Swedish Engineering

EFFICIENT...

WILLISON COUPLERS

The Willison has only four moving parts.

SAFE...

WILLISON COUPLERS

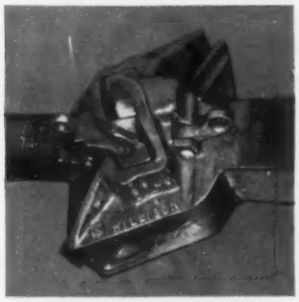
No need for men to go between cars to couple or uncouple.

STRONG...

WILLISON COUPLERS

Coupler and head shank are one-piece steel casting with over 400,000 pound ultimate strength.

VERSATILE...



WILLISON COUPLERS

Used on all types of mine cars and locomotives; with accessories, can couple with link-and-pin hitchings; can be used with cables on incline haulage or odd pulling requirements.

PROVEN...

WILLISON COUPLERS

Over 100,000 Willisons in service in the U.S. and overseas.

- Rubber Cushioned Units
- Mine and Industrial Car Trucks
- NACO Steel Wheels
- NACO Steel Links and Swivel Hitchings

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Established 1868

Transportation Products Division
Cleveland 6, Ohio

International Division Headquarters
Cleveland 6, Ohio

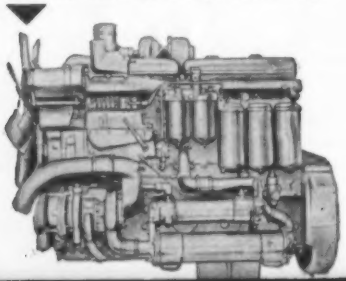
Canadian Subsidiary
National Malleable & Steel Castings
Company of Canada, Ltd., Toronto 1, Ontario

Power-steer and power-shift

with TD-25 standard equipment ...for full-load turns ...full-speed cycles!

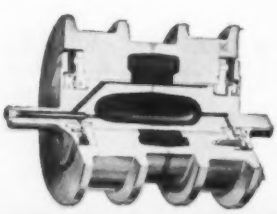
Keep big rock loads on the move *full time*, with exclusive Planet Power-steering. Full power on both tracks, full time is the answer! And Hi-Lo, on-the-go power-shifting lets you match power to condition, instantly, and keep the yard-boosting advantage of uninterrupted momentum!

Big power "plus" of the new TD-25 is the new direct-start, turbocharged 6-cylinder International DT-817 diesel engine. This versatile engine also powers International Payscraper®, Paywagon®, and rear-dump Payhauler® models — plus the TD-25. Equipment-spread power standardization simplifies your servicing and parts-stocking.



Cleaning the face of a Missouri strip mine behind a big dragline, this TD-25 shoves "tractor-sized" boulders aside with the greatest of ease. The "25" also builds dragline walkways and haul roads; pushes loaded trucks; and drastically cuts the cost of clearing new stripping areas.

Thickest-shelled roller design in the crawler industry—with king-size lube reservoirs and seal-protecting pressure-relief passages—let you power-lubricate without affecting seal life or efficiency. These are Dura-Rollers—the track rollers that make 1,000-hr lube intervals practical!



No attachment! No after-thought! No stop-gap!

Years'-proven Planet Power-steering and Hi-Lo power-shifting are *designed-in, built-in,* basic standard equipment of the new 230-hp International TD-25.

With "live-track" Planet Power steering, you get full-load king-size crawler efficiency on turns, as well as straight-aways. And Hi-Lo power-shifting gives you on-the-go matching of power to load to give you big, cycle-speeding advantages!

International Planet Power-steering eliminates load-limiting "dead-track" drag. And Hi-Lo power-shifting does away with time-wasting "gear-shift lag." No wonder the new TD-25 can outearn king-sized clutch-steered crawlers up to 50%—on tough high-walling; overburden removal; and many other coal, mineral, or building-material mining jobs!

Big-capacity track-and-engine teamwork

New TD-25 7-roller tracks are strength-matched to team with the full effort of the New 230 hp diesel engine. The "25" is platformed on super-rugged double-box-beam frames—and carried smoothly on International's new minimum-maintenance Dura-Rollers!

Press the direct-start button, to command the "25's" free-breathing diesel horsepower. Dual valving of the "25's" high-torque DT-817 engine provides for peak turbocharging efficiency—to deliver full-rated performance from sea level to timberline!

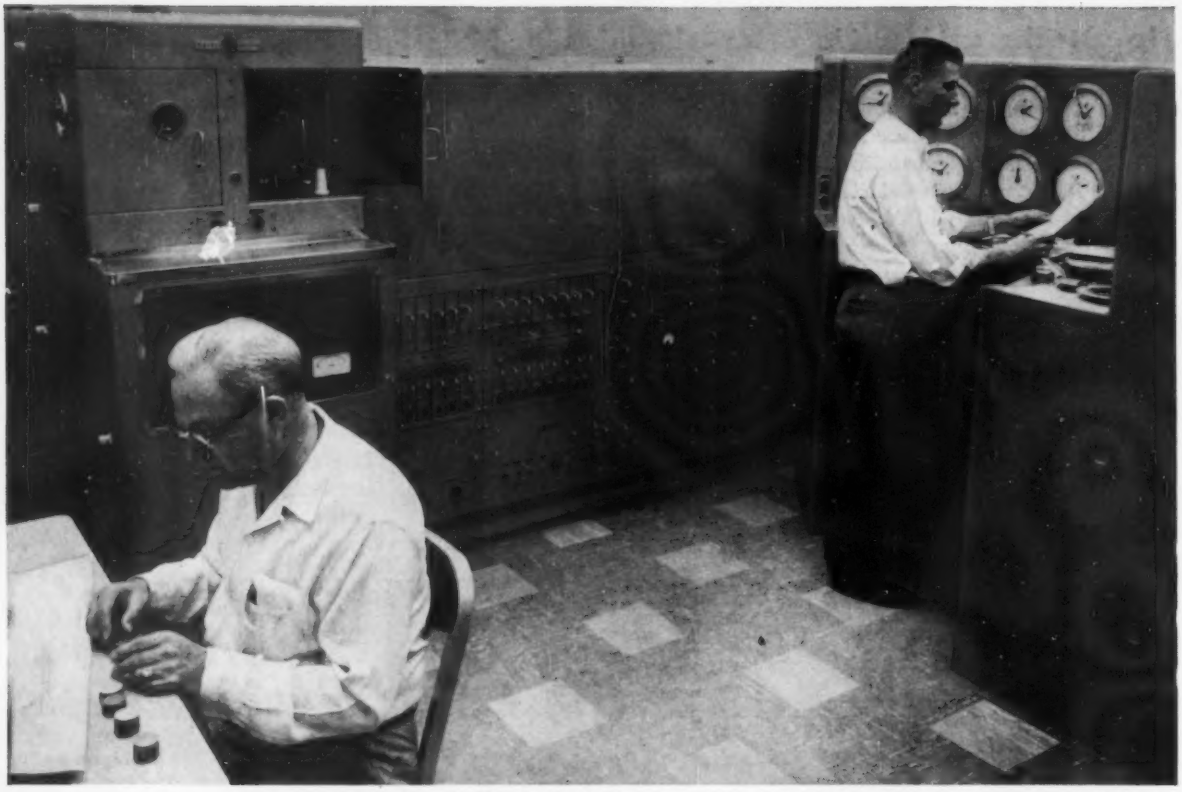
Full TD-25 performance is at your fingertips, full time!

Power-shift and power-steer the new "25" with king-sized loads—around curves, upgrade, anywhere. Compare years-proven simplified International planetary design that's engineered and located to break the load-limiting, time-losing steering and shifting bottlenecks which plague king-sized clutch-steered crawlers. Measure all the "25's" standard equipment extra value features. Let your International Construction Equipment Distributor demonstrate!

International® Construction Equipment

International Harvester Co., 180 N. Michigan Ave.

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers and Bottom-Dump Wagons . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.



Accurate to one ten thousandth of one percent. With this new "Direct Reader" Spectrograph, CF&I maintains extraordinary control over each melt of steel. Samples, taken from the blast furnace or open hearth, are sped to the lab via pneumatic tubes. In minutes, a complete spectrographic analysis is ready. This "controlled chemistry" means Grinding Balls and Rods that wear longer, grind more efficiently.

What CONTROLLED CHEMISTRY means in CF&I Grinding Balls and Rods

CF&I takes great care in the selection of steels used in its grinding balls and rods. For example, each size ball from the smallest to the largest (¾" to 5" diameter) must have the proper composition to give the best balance between hardness and toughness. CF&I's modern spectrographic equipment assures you balls with the correct chemistry in relation to their size. In fact, CF&I uses different steels, depending on the ball size required. This chemical control pays off in your mill because CF&I balls have greater resistance to abrasion, withstand impact, and grind at lower cost.

In grinding rods, CF&I observes similar standards. Special analyses of high carbon steels are hot-rolled and machine-straightened to close tolerances, from 1½" to 4" diameter in whatever lengths ordered. CF&I's controlled chemistry techniques result in grinding rods that have excellent wearing properties, resisting bending or premature breakage.

For the complete story on the advantages of CF&I Grinding Balls and Rods, get in touch with your local CF&I Sales Office.

Other CF&I Steel Products for The Mining Industry

CF&I Mine Rail and Accessories • CF&I Rock Bolts • Realock Metallic Fabric
CF&I Industrial Screens • CF&I-Wickwire Rope • CF&I Grader Blades

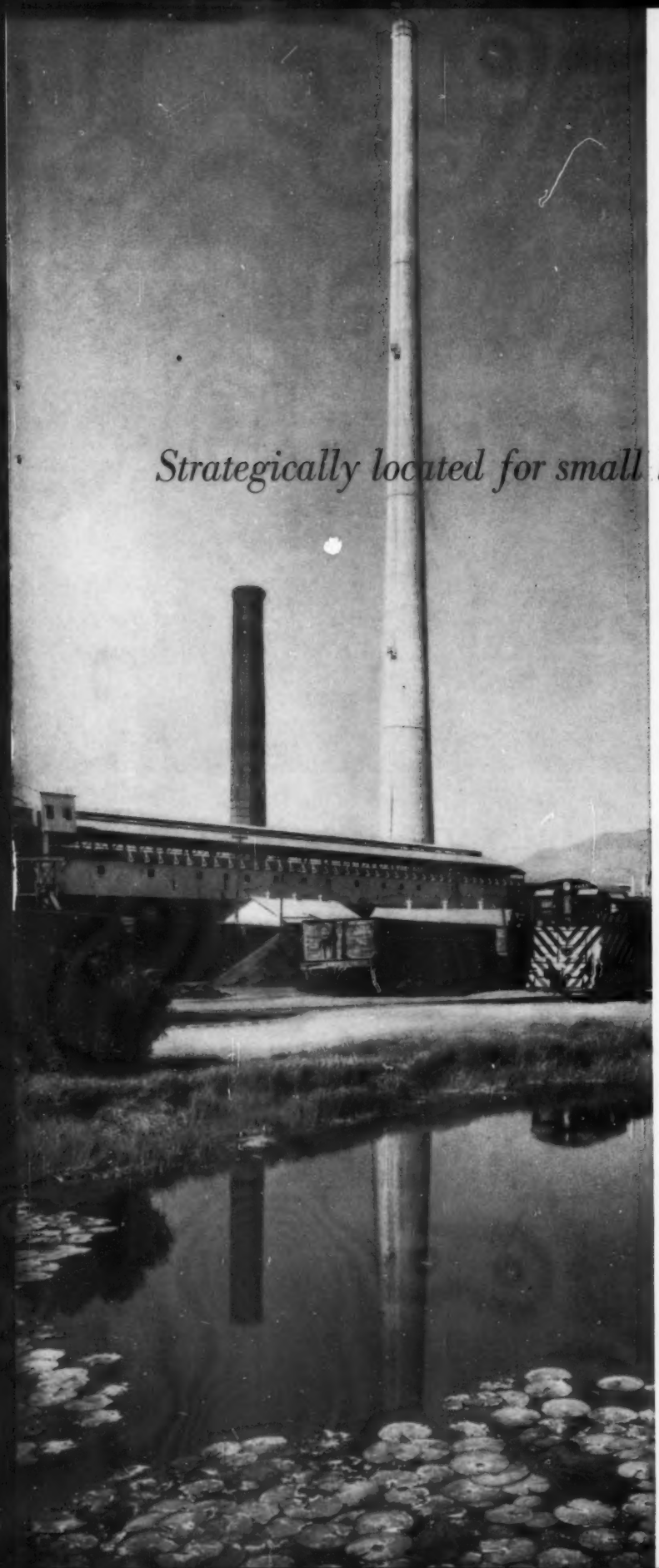
CF&I STEEL

MINING PRODUCTS

THE COLORADO FUEL AND IRON CORPORATION

7528

In the West: **THE COLORADO FUEL AND IRON CORPORATION**—Albuquerque • Amarillo • Billings • Boise • Butte • Denver • El Paso • Ft. Worth • Houston Kansas City • Lincoln • Los Angeles • Oakland • Oklahoma City • Phoenix • Portland • Pueblo • Salt Lake City • San Leandro • Seattle • Spokane • Wichita
In the East: **WICKWIRE SPENCER STEEL DIVISION**—Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans • New York • Philadelphia



See ASARCO first
buying, smelting, and
refining all types of ores:
GOLD, SILVER, LEAD,
COPPER AND ZINC ores
and concentrates, blister
copper, mattes and residues
20 Smelters and Refineries

Strategically located for small lots or carload quantities...

LEAD SMELTERS
Selby, California
Leadville, Colorado
East Helena, Montana
El Paso, Texas
Chihuahua, Chih., Mexico
San Luis Potosi, S.L.P., Mexico

ZINC SMELTERS
Amarillo, Texas
Corpus Christi, Texas
Rosita, Coah., Mexico

COPPER SMELTERS
Hayden, Arizona
El Paso, Texas
Tacoma, Washington
San Luis Potosi, S.L.P., Mexico

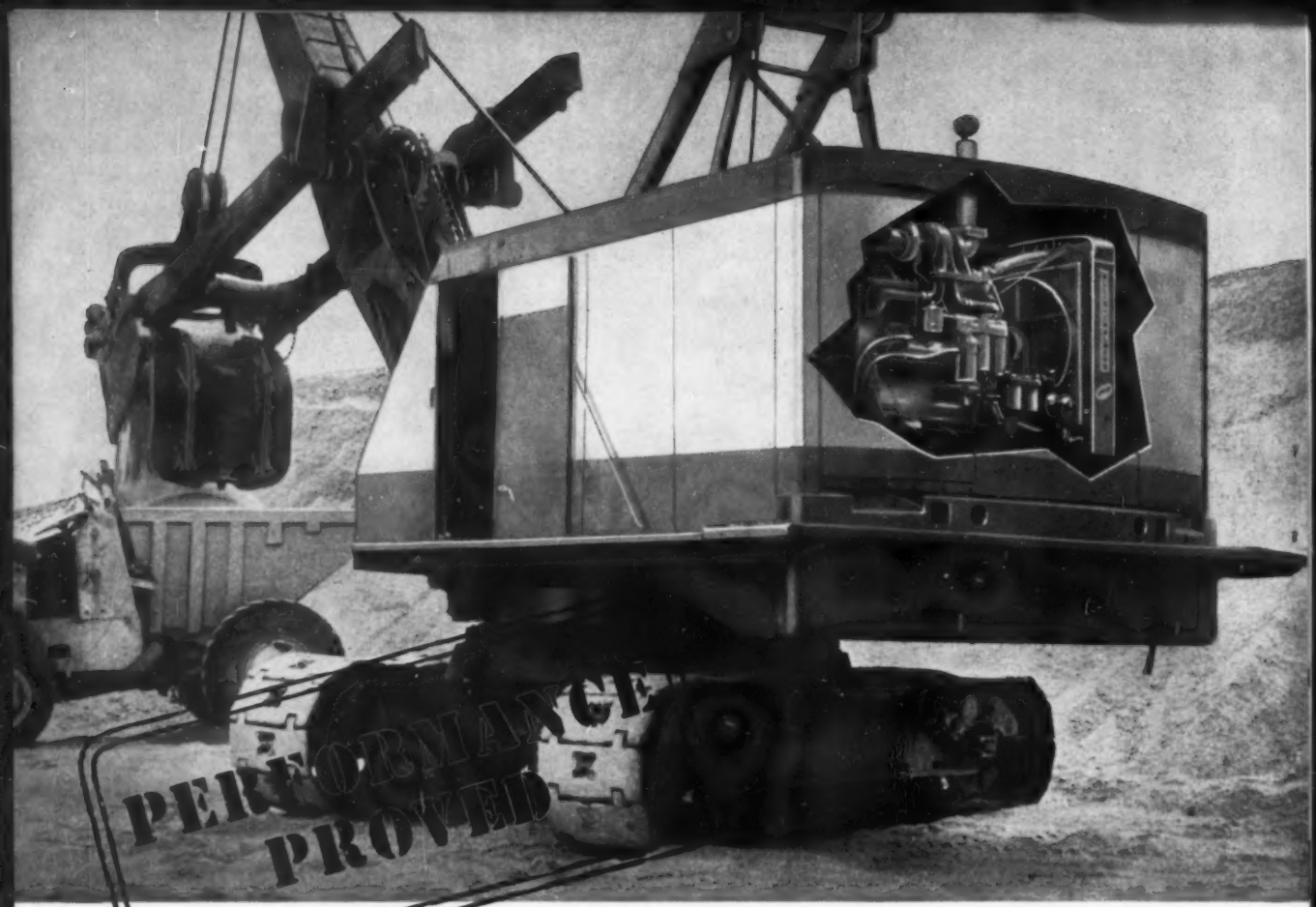
LEAD REFINERIES
Selby, California
Omaha, Nebraska
Perth Amboy, New Jersey
Monterey, N.L., Mexico

COPPER REFINERIES
Baltimore, Maryland
Perth Amboy, New Jersey
Tacoma, Washington

See management
at above locations
or write to main office.
American Smelting and
Refining Company,
Ore Purchasing Department,
120 Broadway,
New York 5, N. Y.

58-54

ASARCO



"We tried burying the bucket in the bank but couldn't... thanks to that 21000 diesel"

— That's a comment on performance of the Allis-Chalmers 21000 diesel repowering a 2½-yd shovel belonging to the Electro-Metallurgical Co., Ltd., Killarney State, Ontario.

PERFORMANCE PROVED

"It now seems to have twice the power," says the operator of a Pennsylvania-owned machine in which a 16000 diesel replaced the original engine of another make.

PERFORMANCE PROVED

"17% less fuel, 30 minutes less trip time" — These are the savings effected when a 21000 diesel repowered a truck operated by a logging company in Idaho.

PERFORMANCE PROVED

"Plenty of reserve, with economy and dependability to boot," states the owner of Minnesota Construction Company, who has several pieces of equipment powered by 16000 and 21000 diesels.

"We can hardly believe the fuel economy" — "'Startingest' engine we ever had" — "Don't understand why anyone would want an old-fashioned 'smoker' again," comment others. Everywhere, on every type of installation, the amazing 16000 and 21000 are "performance proving" their greater economy, their top usable power, their superior starting. If you want diesel advantages like these, see your Allis-Chalmers dealer for details. Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

POWER **FOR A GROWING WORLD**

AC ALLIS-CHALMERS

BC-25

Has no springs, rides on Hydrair*

—With Haulpak's exclusive air-hydraulic suspension system, you completely eliminate maintenance and repair of springs. 4 Hydrair units cushion against loading and travel shocks . . . keep unit riding level over bumps and holes. LW Haulpak also has exclusive LW power-transfer differential — permits unit to haul over wet, muddy areas that bog down competitive trucks.

You will haul more tons per hour at lower cost . . . with

LW Haulpak®

Low loading height—(only 10'1" on 32-ton size) and large top opening (14'5" x 11') makes it easy to load LW Haulpak *fast*, without spillage.

This modern off-highway truck gives you highest output at lowest ownership and operating costs. You get these profit-making benefits because the all-new, fully-proven LeTourneau-Westinghouse Haulpak is built *specifically* for rugged, heavy-duty hauling. It is not a "beefed-up" highway truck . . . nor does Haulpak have the maintenance problems common on ordinary haulers.

Notice, for example, Haulpak's rugged "V"-shaped body. This exclusive LW design gives you *bonus* yardage within a short wheelbase . . . makes for easy loading . . . and provides a low center of gravity for exceptional stability.

LW Haulpak's short, 130-inch wheelbase gives you unusual maneuverability (makes non-stop U-turn in area only 44'6" wide . . . shortest turning radius of any big off-road truck). You spot, swing around, back up and dump *fast* . . . you eliminate most maneuvering delays, complete faster cycles. You have "feather-touch" power-steer, too . . . system is located high behind bumper, well protected from damage.

And, very important, time lost for maintaining your Haulpak is practically nil. It needs *no* daily lubrication. The entire Haulpak lubrication check—*needed only at 500-hr intervals*—consists of just 4 easily-reached grease fittings. In addition, LW Haulpak's various parts and assemblies—some of them tested and proved by *millions of hours* on LW Tournapulls® all over the world— are much stronger than those used on competitive haulers.

22, 27, 32-ton sizes

Write for detailed specifications on the size Haulpak that fits your needs. Available in 22, 27, and 32-ton sizes . . . 320, 335, and 375 hp. Compare its features with any other truck in the industry . . . you be the judge!

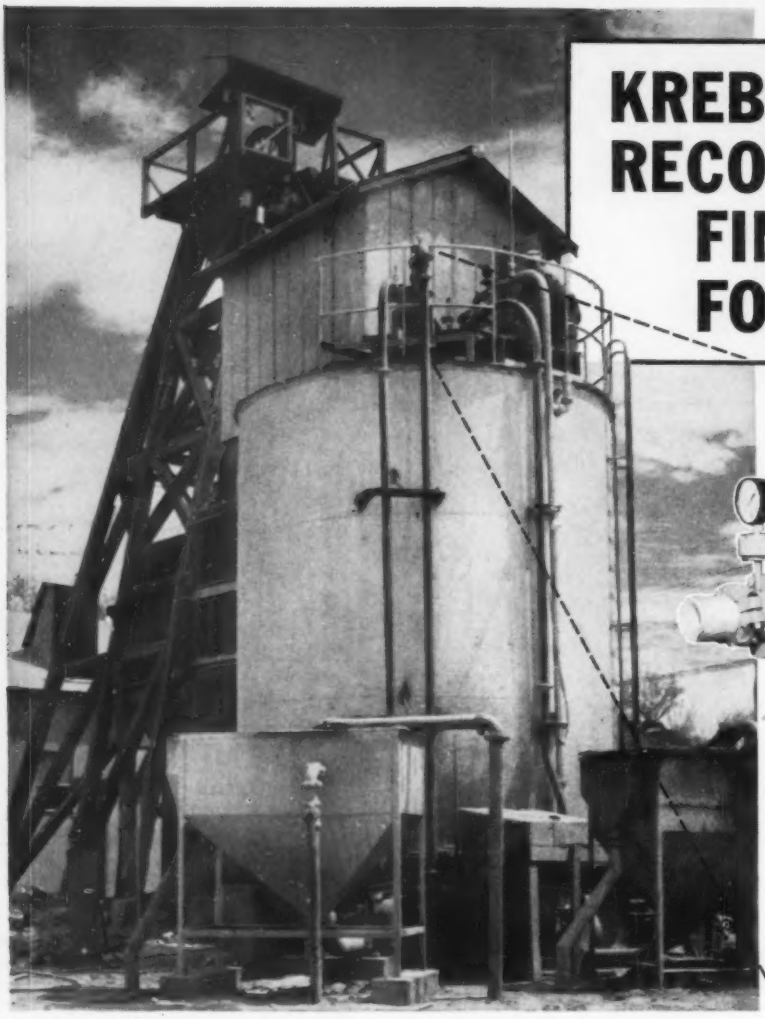
Haulpak—Trademark Reg. U.S. Pat. Off. HP-2155-G-1r

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

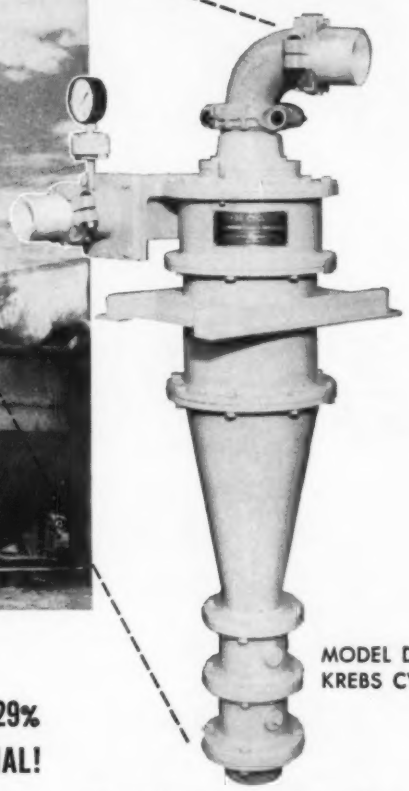
A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

KREBS CYCLONES RECOVER 80% OF FINE TAILINGS FOR MINE FILL



Installation at Banner Mining Company Copper Operation near Tucson, Arizona



MODEL D10B
KREBS CYCLONE

EXCEPTIONAL WEIGHT RECOVERY FROM TAILINGS OF 29% SOLIDS CONTAINING 47% MINUS 325 MESH MATERIAL!

GOOD PERCOLATION AND FAST SET! Fresh pours drilled from after 4 hours... ore blasted down on fresh fill the following shift.

Results for the above application were closely predicted in advance from test work performed in our Pilot Plant. Units were recommended that would meet the objectives of high weight recovery from a fine product in an area where water was scarce.

There are Krebs Cyclones of the correct size and design available for your specific objectives.

PERFORMANCE CHART OF 2 KREBS D10B CYCLONES AT BANNER MINING COMPANY

	FEED	OVERFLOW	UNDERFLOW
% Solids	29.0	9.0	74.0
SIZING—	FEED	OVERFLOW	UNDERFLOW
% +100	4.9		6.2
+150	10.2		13.0
+200	12.7		16.2
+325	25.2		32.2
-325	**47.0**	**100.0**	**32.4**

EQUIPMENT ENGINEERS INC.

737 LOMA VERDE AVENUE • PALO ALTO, CALIFORNIA

SPECIALIZING EXCLUSIVELY IN CYCLONE TECHNIQUES

You can reduce costs with Tournatractor

It travels faster and works faster

To determine, for your own satisfaction, the money-saving advantages of the big LeTourneau-Westinghouse Tournatractor, time its performance against any track-type tractor. You will quickly see one of the main reasons it *gets more work done.*

What you will find, is that on clean-up and maintenance jobs at scattered locations in your pit, a track-type tractor spends much of its time just traveling between jobs. With Tournatractor you can reduce this travel time by more than half. As a result, you accomplish the same amount of work *with fewer machines and at lower cost.*

The big advantage:
Fast work and travel speeds

Tournatractor travels job-to-job at speeds more than twice as fast as the fastest crawler tractor. It travels between assignments at speeds to 27 kph (17 mph). You will find, as a result, that one rubber-tired LW tractor can often handle more work over a wider area than 2 *or more crawler-tractors!*

Yet, because Tournatractor is fast, do not get the idea it is light weight or unable to withstand hard work. On the contrary! It has excellent power and ruggedness. With 218 hp and 15.4 metric tons of weight, it can match production with any tractor its size. Use the LW tractor for shovel clean-up, for pushing rail cars, for fast push-loading or towing service, for maintenance of haul-roads and for drainage work. You will also find Tournatractor ideal for compacting stockpiles, because with its tires hydrofiated, this machine provides bonus compaction equivalent to an extra 18 metric ton roller.

We shall be pleased to send you complete information on Tournatractor. The world-wide LeTourneau--Westinghouse Distributor organization assures you prompt delivery of LW factory assured parts and efficient repair service.

Tournatractor—Trademark Reg. U.S. Pat. Off. CT-2202-MQ-Ir

This Tournatractor is one of 3 owned by a large U.S. copper mine. These LW tractors work 16 hours a day to clean-up around shovels, to maintain waste dumps and haul roads, and to tow stalled trucks and other equipment.

LETOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

More proof that...

AMSCO HELPS YOU MOVE MORE TONS PER DOLLAR

How AMSCO screen parts and Simplex 2-Part Dipper Teeth are giving users greatly improved service life

AT A LARGE NEW ENGLAND QUARRY

AMSCO CHUTE PLATES LAST 5 YEARS VS. 4 WEEKS FOR PREVIOUS TYPE

In the screen house of this quarry, two Amsco HC-250 abrasion-resistant chute plates are used on each Hi-G discharge screen. 500 tons per hour pass over each plate, during the two-shift, 20-hour operating day.

This installation resulted from a previous test, in which a set of Amsco plates was compared with regular carbon steel plates. The Amsco Chute Plates *lasted about 5 years*, whereas the competitive plates had to be replaced every 4 weeks.

The quarry operator reports that the Amsco plates presently installed are holding up excellently in service. Their exceptionally long life and trouble-free service means big dollar savings—through elimination of costly shutdown time.

ON THE NIAGARA POWER PROJECT

AMSCO SIMPLEX 2-PART TEETH DIG 40,000 YARDS OF ROCK BEFORE REPLACEMENT

At the right, you see the type of rugged rock excavation in which this outstanding service record was set. It's part of the Niagara Power Project—Conduit #2 South—being handled by Gull & Defelice Construction Company.

All dippers on the job are equipped with Amsco Simplex 2-Part Reversible Teeth. They operate 16 hours a day, 6 days a week—*handle approximately 40,000 yards of rock*—before tooth replacement is required.

In addition to their exceptionally long wear, the fact that Simplex Teeth *can be replaced in ten minutes with no trouble* is an important advantage to the operators. It all adds up to big savings—in replacement cost and shovel downtime.

Wherever high impact and abrasion are problems, you'll "move more tons per dollar" with Amsco Dippers, Dipper Teeth and Crusher Parts. See your equipment dealer, or write us direct for technical bulletins.

AMSCO

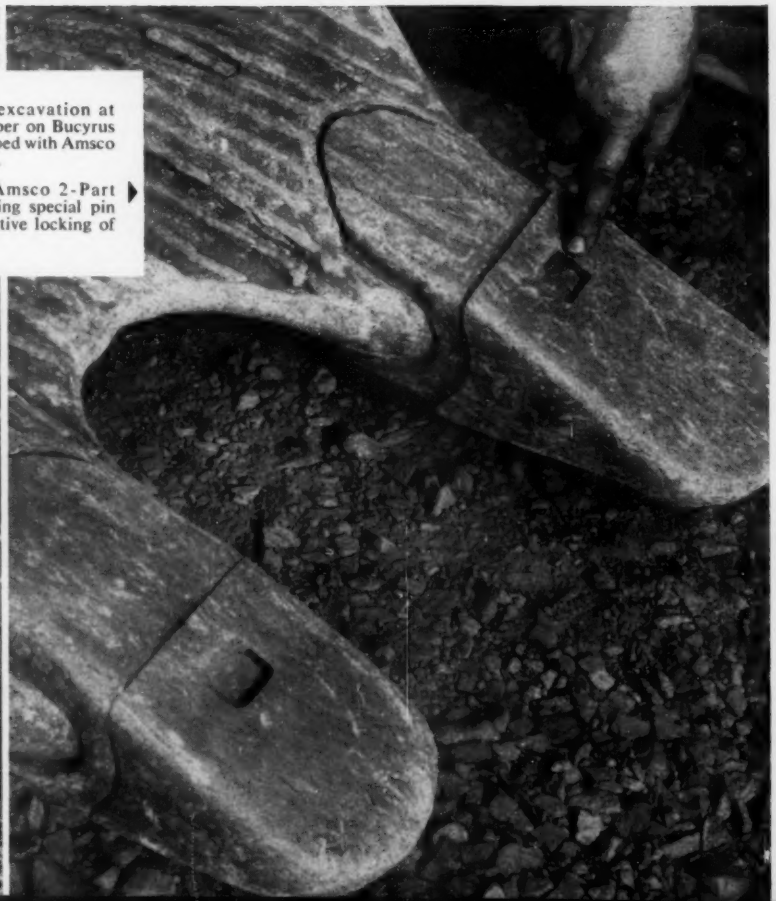
American Manganese Steel Division • Chicago Heights, Ill.

Other plants in: Denver • Los Angeles • New Castle, Dela. • Oakland, California • St. Louis
In Canada: Joliette Steel and Manitoba Steel Foundry Divisions
Welding products distributed by Canadian Liquid Air Co., Ltd.

AMERICAN Brake Shoe COMPANY

Left: Close-up of Amsco Chute Plates used on each discharge Hi-G screen.

Right: General view of Hi-G screen in screen house of large New England quarry.



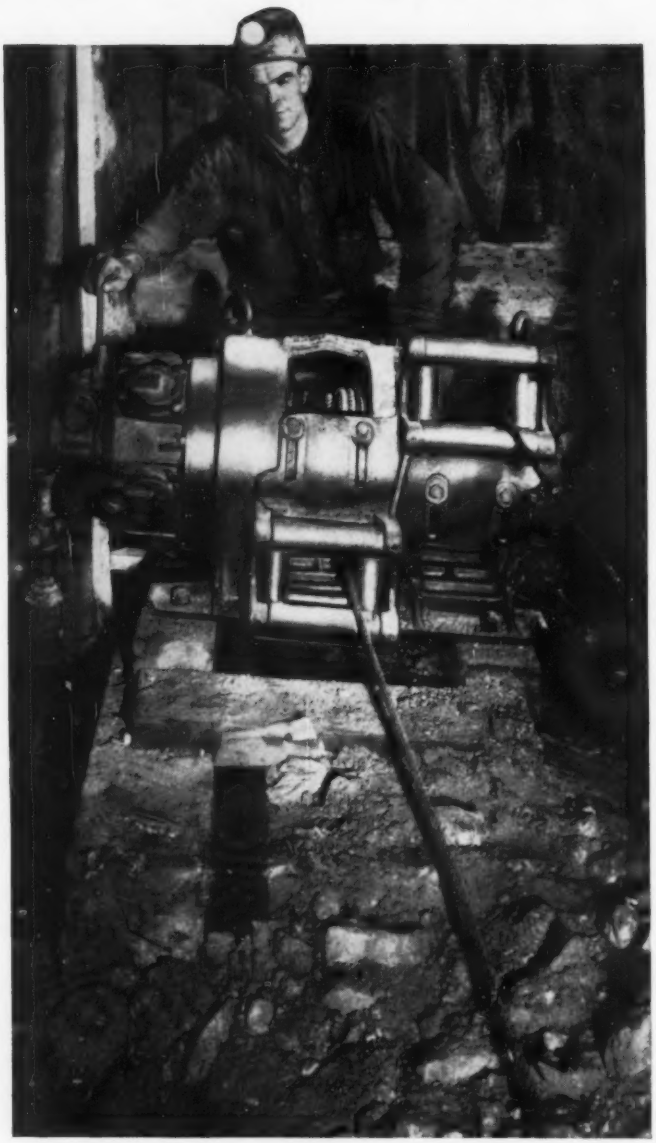
Left: General view of excavation at Conduit #2 South. Dipper on Bucyrus Erie 88B shovel is equipped with Amsco 2-Part Reversible Teeth.

Right: Close-up of Amsco 2-Part Reversible Teeth, showing special pin lock which assures positive locking of the reversible tip.

MOVE MORE ORE WITH GARDNER-DENVER "AIRSLUSHERS"

. . . power for a full scraper every trip

. . . speed for faster round trips



Plenty of slushing power—high-torque, 5-cylinder radial air motor provides digging and tugging power to fill scraper on every pass.
Easy to operate—single lever controls power in either direction. When lever is released, air motor stops—does not waste air idling.
Stays underground—air motor and drive are completely enclosed to keep water and dirt out . . . oil in. Parts are designed to deliver maximum service with little maintenance.
No clutch facings to wear—simple roller clutch automatically and instantaneously engages one drum and releases the other as throttle is reversed.
Only three points to oil—air motor, gear train and throttle valve.

Move more muck with the finest of slusher hoists—Gardner-Denver "Airslushers." Write for details.

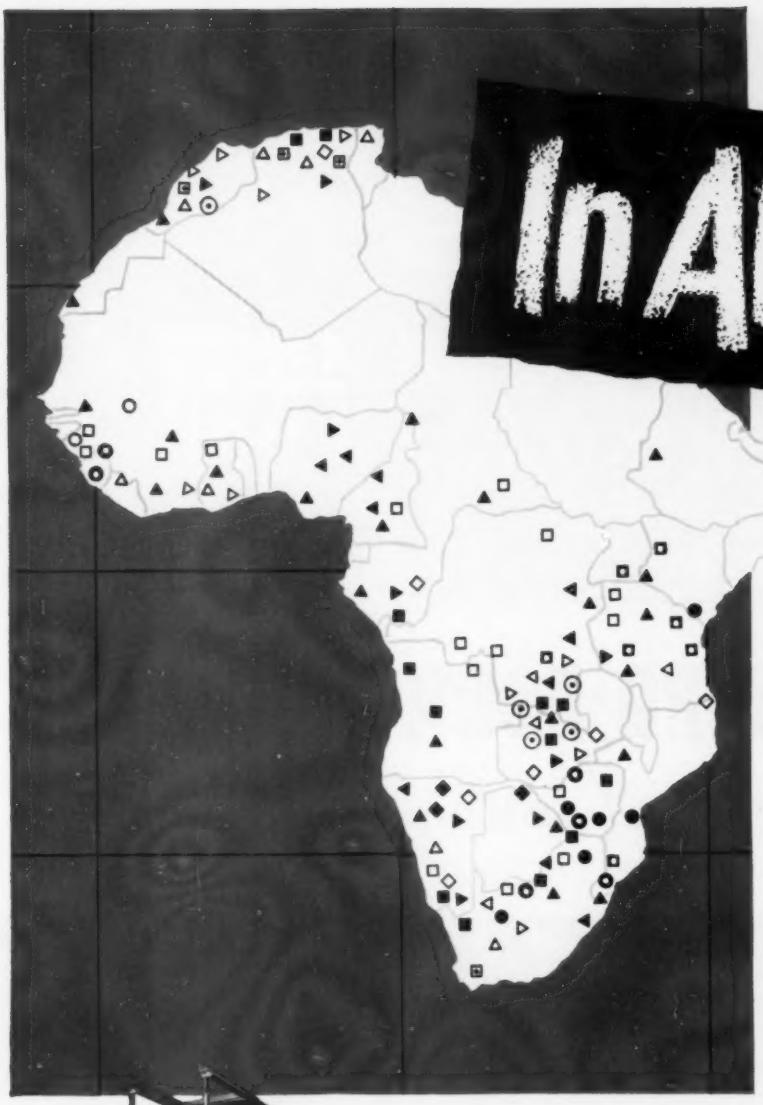
CALL THE GARDNER-DENVER MAN

Your Gardner-Denver mining equipment specialist is trained to assist in drilling and mucking problems . . . to help keep your Gardner-Denver equipment in tiptop shape. At Gardner-Denver *there's no substitute for men*—our 100-year philosophy of growth.

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
Export Division, 233 Broadway, New York 7, New York
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario



In AFRICA

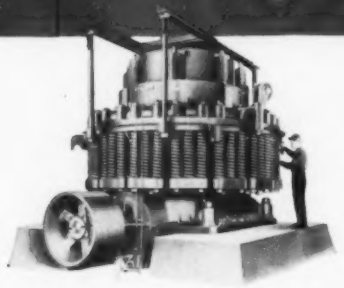
...SYMONS® CONE CRUSHERS

used for efficient reduction of ores and minerals

(Partial list of Africa's ores and minerals. Symbols indicate location of important deposits.)

● ASBESTOS	▶ LEAD
○ BAUXITE	▷ MANGANESE
◘ CHROMIUM	◘ MICA
⊙ COBALT	⊞ PHOSPHATES
■ COPPER	◀ TIN
□ DIAMONDS	◁ URANIUM
▲ GOLD	◆ VANADIUM
△ IRON	◇ ZINC

. . . as well as aggregates, cement rock, gravel, etc., for the construction industry.



SYMONS CONE CRUSHERS
. . . The machines that revolutionized crushing practice . . . **are built in a wide range of sizes, for capacities to over 900 tons per hour. Write for descriptive literature.**

In all of the great ore and mineral operations around the world . . . there has been no record to equal the performance of Symons Cone Crushers in consistently and efficiently producing great quantities of finely crushed product at low cost.

In Africa, hundreds of Symons Cones are used by leading producers of most of the ores and minerals found in this giant continent. As an indication of its mineral wealth, it is significant to note that Africa produces almost 75% of the world's cobalt, 65% of its gold, 50% of its antimony, 33% of its manganese, chrome and phosphates, 25% of its copper, 15% of its lead and tin, a large part of its uranium and practically all of its diamonds.

The use of Symons Cone Crushers in Africa is another example of the way in which these efficient crushers serve the mining and mineral processing industries of the world.

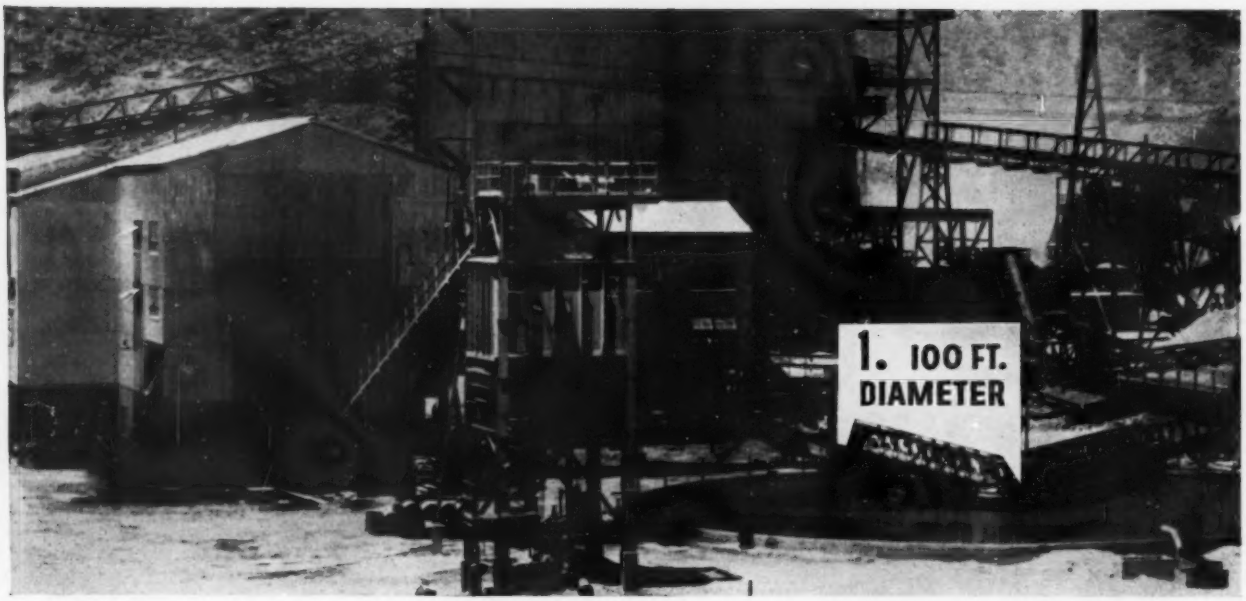
NORDBERG MFG. CO., Milwaukee 1, Wisconsin

©1959, N. M. CO. M159

SYMONS . . . a registered Nordberg trademark known throughout the world.

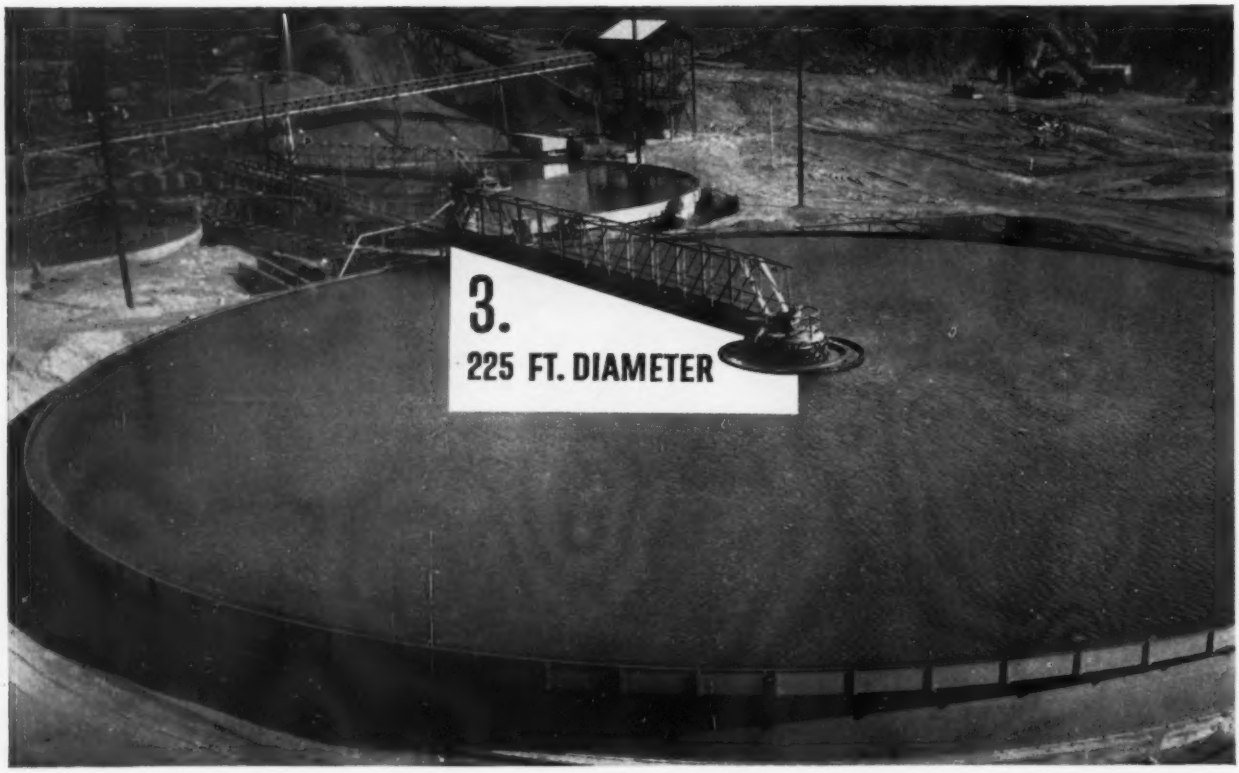
NORDBERG

ATLANTA • CLEVELAND • DALLAS • DULUTH • HOUSTON • KANSAS CITY • MINNEAPOLIS • NEW ORLEANS • NEW YORK • ST LOUIS
SAN FRANCISCO • TAMPA • WASHINGTON • TORONTO • VANCOUVER • JOHANNESBURG • LONDON • MEXICO, D. F.



THIRD DORR THICKENER

Kaiser Steel again expands facilities



INSTALLED AT EAGLE MOUNTAIN

at West Coast iron ore concentration plant

Matching the demands of West Coast steel production has involved a continuous expansion of Kaiser Steel's iron ore concentration plant at Eagle Mountain, California.

This expansion is demonstrated in the photos shown here. Initial Dorr-Oliver equipment installed at the plant included a 100 ft. dia. Dorr Thickener. In 1956, a 125 ft. dia. unit was added. Now a third Dorr Type S-800 Thickener, 225 ft. in diameter, is in operation.

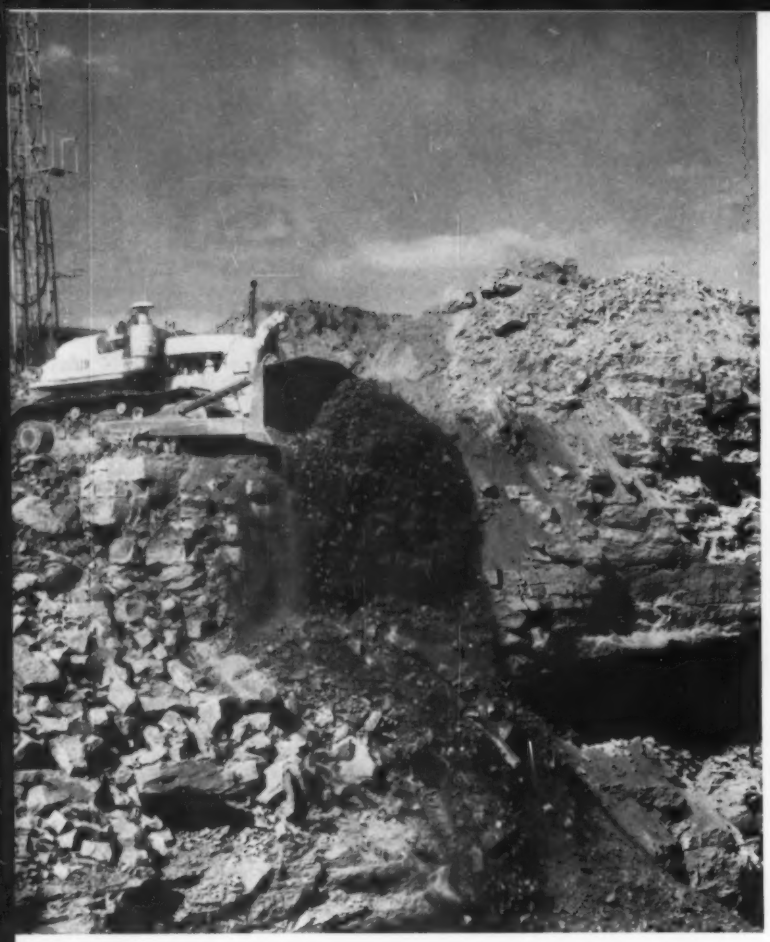
The new unit is designed to handle approximately 2400 tons per day (dry basis) of low grade iron ore and gangue. Feed is 14 to 16 thousand gallons per minute of slurry containing 2% to 4% solids. Hinged rake arms raise to prevent stalling when overloads occur and automatically lower to normal position as continuous raking corrects the condition.

For more information on the complete line of Dorr Thickeners, write for a copy of Bulletin 3001. Dorr-Oliver Incorporated, Stamford, Connecticut.

Dorr—Reg. T.M. U.S. Pat. Off.

DORR-OLIVER

WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT



"CLASH-BOX" robbing your CASH-BOX?

Crawlers without full-power shift are obsolete . . . and costly!

If your crawlers have master clutches and manual shift transmissions—"clash-boxes" as they're commonly called—you may be passing up profits that should be yours.

With proven Torqmatic Drive in the Model C-6 and the TC-12, Euclid Crawlers provide full-power shift and instant reverse. There's no loss of power or momentum when changing from one speed range to another . . . no delay for clutching and shifting . . . and with a flick of the wrist you change travel direction fast. It's a dependable power train, too . . . proved in thousands of "Euc" earthmovers on every kind of job.

Have your dealer show you how Euclid Crawlers have more productive capacity on any tractor work . . . dozing, ripping, push loading big scrapers, or towing heavy loads. The seconds they save on every work cycle can add up to more cash in your cash box!

EUCLID Division of General Motors, Cleveland 17, Ohio
Plants at Cleveland and Hudson, Ohio and Lanarkshire, Scotland.

Proven Torqmatic Drive provides smooth steady flow of power . . . full-power shift . . . instant reverse . . . easy operation. For push loading scrapers the fast maneuverability of "Euc" crawlers cuts scraper cycle time and steps up production . . . changes from one speed range to another, and from forward to reverse and back again, are made under full power . . . there's no clutching.

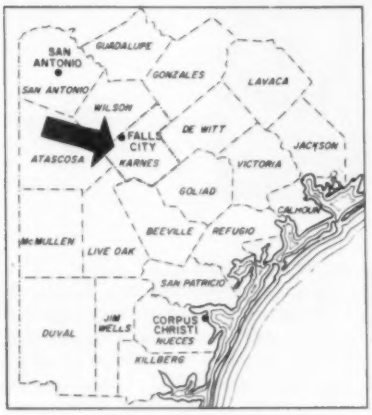
GM GENERAL MOTORS EUCLID

EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE

First Texas Uranium Mill Planned in Karnes County

Susquehanna-Western, Inc. has announced plans to build a 200-to 250-ton-per-day uranium mill near Falls City, Texas. Company president Allen D. Gray reports that his firm has been checking uranium ore bodies in south Texas for many months and has determined that these deposits justify mill construction. Susquehanna-Western is completing final negotiations with the United States Atomic Energy Commission for purchase of concentrates from the new mill. The firm operates a 500-ton-per-day uranium mill at Riverton, Wyoming, and its subsidiary, Mines Development, Inc., a custom uranium mill at Edgemont, South Dakota.



It has long been known that uranium reserves in Texas were large enough to warrant a mill; in fact, the AEC announced in March 1938 that reserves in Karnes and Duval counties totaled 1,713,000 tons of 0.25 percent U_3O_8. However, the shallow, easily mined reserves of Karnes County where the new mill will be built are smaller than the unique and difficult to mine ore bodies in Duval County. It is expected that the Duval County ore will be of minor immediate importance.

San Antonio Mining Company, (Climax Molybdenum subsidiary), Continental Oil Company, and Rare Metals Corporation of America all developed ore in the Fayette formation in Karnes County. Both primary and secondary uranium minerals occur in the Eocene-age interbedded shale and sandstone with substantial amounts of volcanic ash.

New Copper Mine Proposed in Chile by Cerro de Pasco

Cerro de Pasco Corporation is making final engineering studies to develop the Rio Blanco copper deposit 35 miles northeast of Santiago, Chile for an annual production of 68,500 tons of copper. Cerro is negotiating with the Chilean government to make this development feasible. Cerro will exercise its purchase option on the stock of the Rio Blanco Copper Corporation, Ltd. of Virginia to gain complete control as the Virginia firm holds all of the stock of Compania Minera Rio Blanco Ltd. which has title to the ore body.

Cerro has been exploring the property by surface diamond drilling since 1956 and has developed more than 116,000,000 tons of 1.6 percent copper ore. Due to the heavy snowfall, it will be necessary to reach the ore body through a 3.5-mile adit and develop an underground block caving mining operation. Cerro has had engineers at work on preliminary designs for mine, mill flotation, and smelter for some time. A pilot plant has milled some of the ore to determine recovery and reagent consumption.

Marietta Gold Flotation Mill Now Operating in Montana

The Northern Milling Company is now operating this new 200-ton-per-day gold flotation mill at its Marietta mine near Townsend, Montana. The heavy sulphide ore (60 percent pyrite and arsenopyrite by weight) from the mine has always created a difficult metallurgical problem because of its high arsenic content. Heretofore concentrates always received a high arsenic penalty at the smelter.

In the new mill, by fine grinding to free the intergrown gold from the arsenopyrite and pyrite, and careful control of the flotation circuit, a lead concentrate low in arsenic is produced. The concentrate assays about 25 ounces of gold, carries some silver, and only 2.7 percent arsenic per ton. Ore is now stoped from several adit levels in the Marietta mine.

W. R. Wade, Marysville, Montana, designed the mill and is consulting engineer for the Northern Milling Company.

THREE WAY SEPARATION . . .

of copper, lead, and zinc in complex ore at

Highlights of Flotation at 1,800 Ton-Per-Day Mill

1. Depress zinc and iron.
2. Make bulk copper-lead flotation concentrate.
3. Clean and re-clean copper-lead concentrate.
4. Depress copper and take it off lead-copper separation cells as a tailing from eighth cell.
5. Clean and re-clean lead float to produce a lead concentrate.
6. Condition copper-lead concentrate tailing for zinc.
7. Float zinc from copper-lead concentrate tailing to make zinc concentrate.

Idarado Mining Company is recovering five metals—gold, silver, copper, lead, and zinc—from complex low-grade ore at its Pandora mill at Telluride, Colorado by flotation and gravity concentration.

Idarado is the only company in the United States, and one of the few in the world, successfully making the difficult copper, lead and zinc separation. It has the lowest combined copper, lead, and zinc content of any company making this separation. Mill feed in 1958 was 0.72 percent copper, 2.07 percent lead, 3.48 percent zinc, 2.08 ounces silver, and 0.08 ounce gold per ton. Some of the gold is recovered in a jig circuit, ahead of flotation and amalgamated for shipment to the United States mint.

So effective is Idarado's milling operation that recovery in 1958 was 94 percent of the copper, 94 percent of the zinc, 92 percent of the lead, 90 percent of the silver, and 88 percent of the gold. Idarado makes this recovery day after day in its 1,800-ton mill which treated 382,100 tons of ore in 1958 working a five-day week. Mill tailings assayed only 0.048 percent copper, 0.18 percent lead, 0.21 percent zinc, 0.23 ounce silver, and 0.009 ounce gold per ton.

Mining of Idarado ore is planned with metallurgy in mind. Stoping is coordinated so that the lead-to-copper ratio is held below three-to-one. Original test work indicated that best results could be obtained if this ratio were less than two-to-one, but subsequent milling operations have made it feasible to raise the lead in the feed without sacrificing either copper or lead recovery. This has been important because the mine has more lead areas to stope than it has copper.

Clean and fresh mineral faces are important in this separation but the

AGITAIR FLOTATION CELLS are used for the difficult separation problem at Idarado. Cells at right center are used to differentially float lead from bulk-copper-lead concentrate. Mill labor efficiency in 1958—55.2 tons-per-manshift.

Idarado's Mill

MILL SUPERINTENDENT M. A. Jorgenson has had lots of flotation experience. He worked at Buchans in Newfoundland and Triumph in Idaho before Idarado.

shrink stoping and great size of the mine (See MINING WORLD, September 1959, pages 46 to 52, for full details) make it impossible to deliver freshly broken ore to the mill. Some ore is dropped over 1,400 feet through a series of ore passes to reach the mill. This is reflected in rod mill feed which is 11 percent minus-325-mesh. Certainly the more friable sulphides—chalcopyrite, galena, sphalerite, and pyrite—are a higher percentage of this minus-325-mesh fraction than is the harder vein quartz. Galena, which has a strong tendency to slime with resultant recovery difficulty, is undoubtedly adversely affected, metallurgically speaking, in the mining cycle.

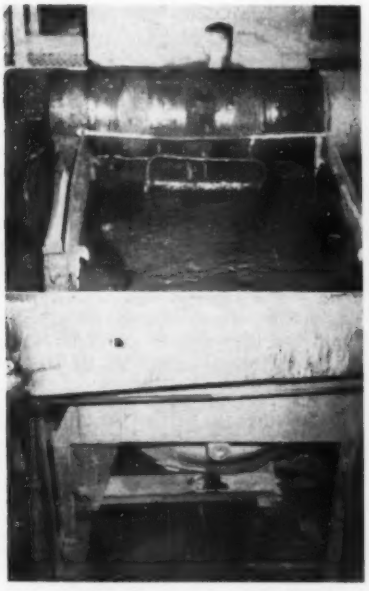
Key point of the mill is the copper-lead separation. Cyanamid reagent 622 has proved successful in depressing chalcopyrite to make this separation possible. It is added at five points in the bank of flotation machines used in making the separation.

Use of sodium cyanide as an iron depressant must be carefully regulated and kept low so as not to depress the chalcopyrite in the bulk copper-lead float. Yet, just enough cyanide must be used to depress the pyrite. Lime is also added for iron depression.

Reagent 404 has proved to be an effective chalcopyrite promoter, as well as for galena.

Contact time in the first conditioner cell of the copper-lead rougher circuit is another critical factor. Any time over 1.5 minutes is detrimental to selective flotation of copper and lead. To minimize contact time, one of the two conditioner cells at the head of this circuit has been bypassed.

Flotation density is maintained at 43 percent solids; warm water, 65° F., from the mine is used to improve flotation. Surface water during many months of the year is as cold as 40°.



PAN AMERICAN JIG treats ball mill overflow to recover free gold in ore.

CLARKSON FEEDERS are on ball mill floor of mill. Reagent mixing is done on floor directly above feeders and product transfer takes place through vertical hoses.

Grade of Concentrates Produced at Idarado Mill

Product	Lead Percent	Zinc Percent	Copper Percent	Moisture Percent
Lead concentrate	67.10	2.78	2.80	7.58
Copper concentrate	2.90	4.47	27.33	11.61
Zinc concentrate	0.50	57.49	0.97	10.55

Normal mill operating crew is only 16 men, as follows: 1 superintendent, 2 crusher operators, 3 ball-rod mill operators, 3 flotation operators, 3 utility men, 1 sample bucker and reagent man, 1 amalgamator, and 2 foremen. There are also a chief metallurgist, a chief chemist, a fire assayer, and two chemists.

Milling labor efficiency in 1958 was 55.2 tons per manshift. Tons milled per underground shift were 7.95, and tons per total operating shift were 4.98.

The Idarado staff is not standing still. Constant checks are made to maintain uniformity of reagents, to determine ways of cutting costs, and simplifying reagents, yet maintaining recovery and grade; also to increase recovery of slimed galena and reduce moisture content of concentrates, as well as carrying on a series of other investigations.

Flowsheet Development

Frank W. McQuiston Jr., metallurgical engineer for Newmont Mining Corporation, played an important part in flowsheet development and design of the enlarged Pandora mill.

The Idarado staff, headed by John S. Wise, general manager, and M. A. Jorgensen, mill superintendent, have increased both tonnage and recovery above calculated points on which the mill was designed and built. Other staff members are A. C. Hilander, general superintendent; Kenneth Tatman, chief metallurgist; W. L. Griffiths, mechanical superintendent; and John C. Keenan, chief engineer.

The two-stage, closed circuit, crushing plant was designed so that one operator for each of two shifts (same as mining and ore haulage) could crush enough ore for three milling shifts. When the mill was enlarged and remodeled in 1955, a new crushing plant was built and housed in a steel building. Minus-2½-inch ore from the 42-inch by 5-foot Nordberg bar grizzly bypasses the 24- by 36-inch Birdsboro jaw crusher. Grizzly undersize and crusher discharge are conveyed to a 6- by 12-foot Tyler rod deck screen which makes a minus-¾-inch undersize product. This is conveyed to two fine ore bins with combined capacity of 1,935 live tons. Tyler screen oversize is conveyed to a 10-51 Allis-Chalmers Hydrocone crusher in closed circuit with screen.

Screen Analysis Rod Mill Feed

Size	Percent Weight
Plus ¾-inch	17
Minus ¾, plus 12 mesh	50
Minus 12, plus 100 mesh	16
Minus 100, plus 325 mesh	6

Open-stage rod mill grinding, followed by closed circuit ball mill grinding, is used. Rod consumption averaged 1.14 pounds per ton ground. Three-inch ball consumption is 1.04 pounds per ton.

Fine ore is drawn from bins, passed under an electromagnet to remove steel blasting cap wire, and weighed before being fed to the 8- by 12-foot Marcy rod mill. When copper lead wire was used for electric caps, it went through grinding circuit and into Pan American jigs where it blinded the beds and interfered with subsequent amalgamation practice. At the request of the mill, the mine switched to iron lead wire, which could be kept out of the jigs. Scrap iron is removed in crushing plant by a suspended magnet ahead of Tyler screen. The coarse crusher is protected by a Dings iron detector on conveyor belt from mine ore bin.

Rod mill overflow feeds a 16- by 28-foot Dorr quadruplex classifier. Overflow goes to flotation. Sand is split and elevated by belts to the Marcy 76 and 86 Grate-type ball mills. Ball mill overflows go over jigs and return to classifier.

Jigs Recover Free Gold

Idarado mine ore, particularly Black Bear vein ore, contains some free gold. By jigging and amalgamation, a gold sponge is made for direct shipment to the mint with a resultant higher price per ounce than is paid for at the smelter. It is important to recover as much gold as possible ahead of flotation as some gold is always recovered in each of the three concentrates. This means lower value for such gold, particularly in the zinc concentrate, for which there is a lower sales price per ounce.

Overflow from each ball mill passes over 42-inch Pan American rougher jigs, each producing a concentrate and a tailing. Concentrate from each rougher jig is pumped to 12-inch Pan American cleaner jigs while tailing returns to classifier. Concentrate from the two cleaner jigs is recleaned on a 12-inch Pan American jig to yield a final jig concentrate for amalgamation. Corduroy tailing from the cleaner jigs is returned to ball mill circuit. Recleaner jig tailing is pumped separately to another corduroy table to produce a concentrate for amalgamation and a tailing which flows to lead thickener. Corduroys are hand washed to recover concentrate.

Feed to batch amalgamation barrel is mercury, recleaner jig concentrate, corduroy concentrate from the two cleaner jig tailing, and corduroy concentrate from the recleaner jig tailing.

After an 8-hour amalgamation period, the amalgamator is tapped into elutriator; the amalgam hand-cleaned and retorted to make a sponge for shipment to United States mint. Mercury is reused.

Concentrate from the lead-copper scavengers and tailing from the lead-copper cleaners are pumped to a Krebs cyclone above the No. 86 Marcy ball mill. Cyclone overflow is piped to classifier and the underflow is fed to mill. Regrinding of this middling is an attempt to liberate mineral grains for separation.

Lead-Copper Separation

Classifier overflow is flotation feed. It flows by gravity to one 60-inch Agitair conditioner which functions primarily as a pumper cell to a bank of twelve 48-inch Agitair roughers. Tailing from twelfth cell feeds pumper cell at head of twelve 48-inch Agitair scavangers. Scavenger concentrate is pumped to regrind. The lead-copper rougher concentrate is then cleaned and recleaned in two banks of four 36-inch Agitair cleaners. Concentrate from the recleaners is feed to the lead-copper separation. This separation is made in eight 36-inch Agitair cells. The tailing from the eighth cell is the copper concentrate.

Concentrate from cell Nos. 3 through 8 in the separation rougher is cleaned and recleaned to make the lead concentrate. Concentrate from the first two roughers simply bypasses the cleaner and enters the feed to the recleaner. Cleaner and recleaner tailing is recycled to head of first lead-copper separation cell.

Zinc flotation feed is the tailing from the lead-copper scavenger cells. It is conditioned in two 10- by 10-foot

Cumulative Screen Analysis Classifier Overflow

Size	Percent Weight
Plus 48 mesh	7
Plus 65 mesh	17
Plus 100 mesh	30
Plus 150 mesh	41
Plus 200 mesh	46
Plus 325 mesh	61
Minus 325 mesh	39

conditioners in series ahead of the zinc rougher circuit comprised of twelve 48-inch Agitairs. Concentrate is taken to cleaning in a bank of six 36-inch Agitair cleaners. Cleaner concentrate is recleaned in four 36-inch Agitairs to make zinc concentrate. The recleaner tailing is recycled to the head of the cleaner and the cleaner tailing pumped to the head of the No. 1 conditioner.

Rougher tailing goes to a pumper cell ahead of the 12-cell bank of 48-inch Agitair scavengers. Zinc scavenger tailing is mill tailing. Scavenger concentrate is recycled to No. 1 conditioner.

Automatic samplers are installed on mill feed, each of the copper, lead and zinc concentrates, zinc feed, and final tailing. The concentrate samples are cut at 10-minute intervals. Feed and tailing samples are cut at 15-minute intervals. Extreme care and cleanliness is exercised in the handling of all sampling equipment and is the final sample preparation. Metallurgical balances are computed each day. Production weights and assays are checked with daily balances each two weeks.

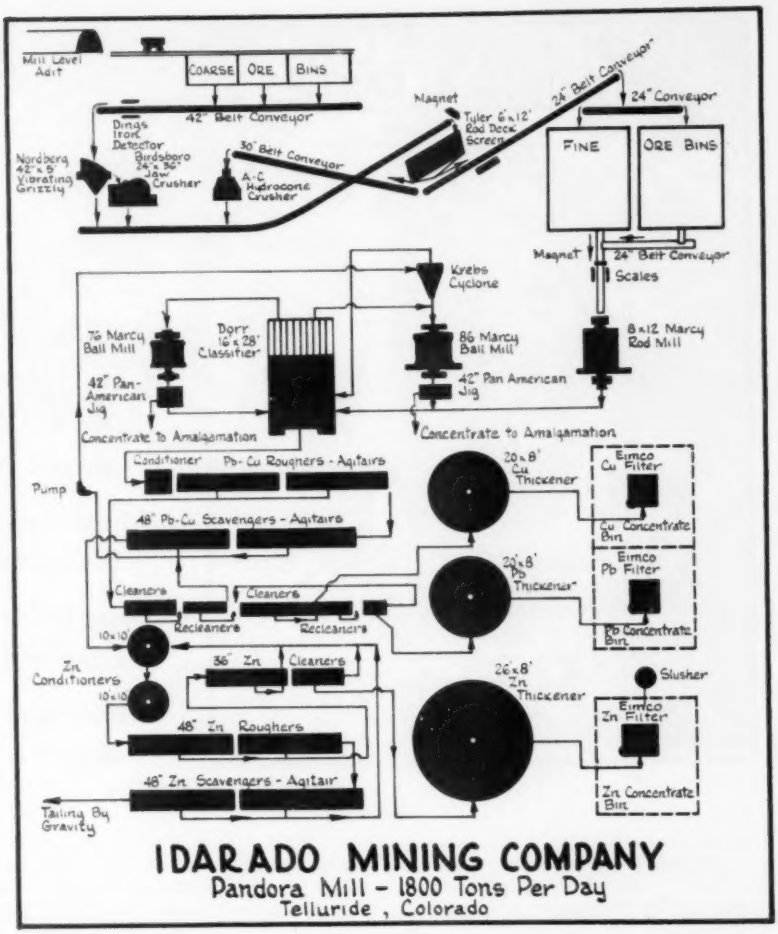
Thickening and Filtering

Copper and lead concentrates are separately thickened in 20- by 8-foot Eimco thickeners with wood stave tanks and two-disc Eimco filters. A 26- by 8-foot thickener and a four-disc Eimco filter are necessary to handle the greater tonnage of zinc concentrate.

The three filters are mounted on floor directly above separate concentrate bins. Cake drops directly into bins which are elevated so that large semi-trailer trucks can back under each. Concentrates are slushed directly from bin into trucks for haulage to the railroad. All concentrates are sold to American Smelting and Refining Company. Lead goes to Leadville, Colorado; zinc to Amarillo, Texas; and copper to El Paso, Texas.

Idarado was a pioneer in the United States in the use of cyclones to build the tailing dam. During the summer months, two men per shift with five cyclones mounted on a truck build enough dam around the pond for winter storage.

Cyclone sand underflow is used to build a solid well-compacted dam. The truck is driven around the pond on the top of the previously-built dam, while the sand from five cyclones builds a new dam at rate of 127 feet per day. The slime flows to the center of the pond where clear water overflows through riser pipes. There is no regular tailing pond man on the mill payroll. END.



IDARADO MINING COMPANY
Pandora Mill – 1800 Tons Per Day
Telluride, Colorado

Reagent Practice at Idarado Mining Company's Pandora Mill, Telluride, Colorado

Reagent	Where Added	Amount (Pounds per ton feed)	Purpose
Lime	Copper-lead conditioner	0.75	Iron depressant
Sodium sulphite	Rod mill discharge	0.45	Zinc depressant
Zinc sulphate	Rod mill discharge	1.22	Zinc depressant
Sodium cyanide	1/3 to rod mill discharge 2/3 to copper-lead conditioner	0.065	Iron depressant
Reagent 404	All mills	0.04	Lead and copper promoter
Methyl isobutal carbinol	Copper-lead conditioner, 10.5 cc Seventh copper-lead cell, 0.5 cc Thirteenth copper-lead cell, 0.05 cc	0.019	Frother
Z-11	Copper-lead conditioner	0.037	Copper-lead collector
Cyanamid 622	Head of separation rougher No. 2 separation rougher cell No. 3 separation rougher cell Lead cleaner, separation Lead re-cleaner, separation	0.306	Copper depressant
Z-6	Thirteenth copper-lead cell	0.005	Copper-lead collector
Z-3	Zinc conditioner	0.10	Zinc collector
Lime	Zinc conditioner	3.07	Iron depressant
Separan	Head of three concentrate thickeners	0.01[1]	Flocculant
Glue	Zinc and copper filters	0.5[2]	Filtering aid

1. Per ton of concentrate produced.
2. Prepared with alum, fed by reagent feeder, per ton of concentrate produced.

Belgian Congo

Part II

Mining World's Travelling Correspondent Visits the Mines and Metallurgical Plants of Union Minière du Haut Katanga. He reports from Kolwezi, Western Katanga, that:

Company Plans Far Ahead for Underground Mining

Strips Kambove West and Musonoi Extension Mines

Uses United States Equipment and Open-Pit Methods

Opportunities for Native Students Lie Ahead in Mining

The westward advance of Union Minière Du Haut Katanga will soon be halted. The company has already traveled far. In the early days, the mines and smelter around Elisabethville were the sum of all activity. Today, the nearest mine of significance, excepting the unique Kipushi (Prince Leopold), is Gambove West, 100 miles west of the Katanga capital.

Another 100 miles beyond is the great Kolwezi group. Here, annual concentrator capacity has been raised to 4,000,000 tons of ore and the new Luilu hydrometallurgical plant is nearly ready to ease the Jadotville-Shitura load. The Marinel hydroelectric station, north of Kolwezi, is equipped for 1,430,000,000 kwh to meet the greater demands caused by increasing depths of work, the higher tonnages needed for a given quantity of metal, and the higher proportion of copper and cobalt to be won by electrolytic methods. All of this as Kipushi copper wanes.

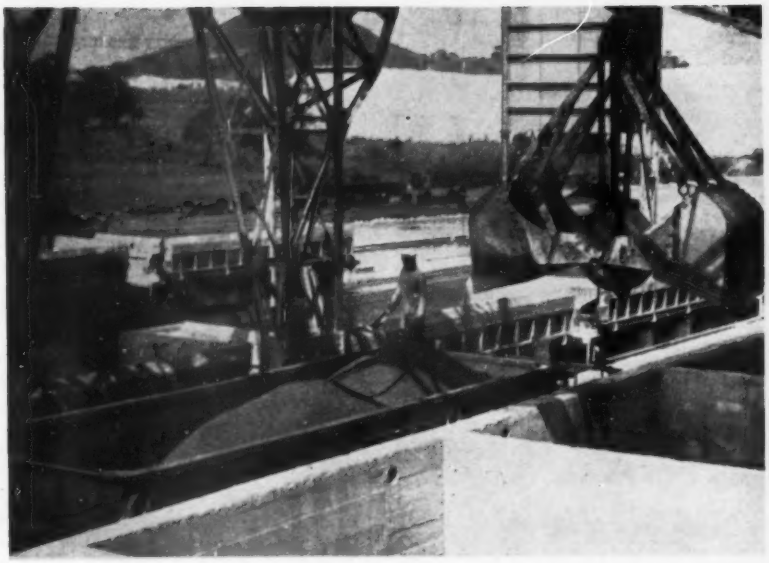
COMPLEX FOLDING AND FAULTING show plainly in the walls of the Sena open pit. High grade has been mined out here.

What, then, are the western mines doing in response to all these costly yet so necessary changes? First, what has geology done for the mines? The rough treatment accorded the migrant ore bodies, hurled into irregular positions upon the younger Kundelungu rocks, has had diverse consequences. A few of the segments (ecailles) may appear as textbook synclines, but most are severed limbs or folds of many patterns, resulting from the overthrust faulting and complicated by secondary dislocations and erosion. The French word "paroxysmes" is expressive.

In the stranded "ecailles," soluble calcareous rocks occur in immediate association with the ore bodies. Mineral carbonates may be found 500 feet or more below the water level. Metallurgical difficulties have been great. In compensation, the Congo was awarded a higher grade of ore and a further premium in the rich and exceptional Kipushi mine, which was certainly an epigenetic stimulant of great financial potency.

The mineralized beds within the "Serie des Mines" show remarkable regularity over great distances, except for grade where migration of minerals into the wall rocks has occurred.

The three members of the series for special attention are, in descending order:



MALACHITE ORE from Ruwe open pit is loaded into railroad cars and hauled to washing plant adjacent to the mine. The picture at right shows monitors sluicing the 1.0 to 2.0 percent copper ore dumped from cars into plant. No Europeans are employed in either the mine or washing plant. The top picture shows the washed malacite, chunks or nuggets, being loaded into cars for shipment to the Kolwezi-flotation mill for further treatment.

Local Name	Formation Description	Typical Width
"S.D."	Dolomitic schist or shale (ore)	30-40 feet
"R.S.C."	for Siliceous Cellular Quartzitic Dolomite (normally barren)	50-70 feet
"R.S.F."	Siliceous laminated beds (ore)	40-50 feet

The overlying formation is comparatively soft, to the benefit of waste stripping. The underlying Dolomitic rocks, known as "R.A.T."—better left untranslated to avoid controversy—are harder, appearing with a characteristically pale lilac color in open-pit mines.

In the upper zones of oxidation, the predominant mineral is malachite, associated with black oxides of copper. In the deep sulphide zone, bornite and chalcocite are the most common; chalcopyrite is rare.

The origin of mineralization is still the subject of keen discussion among geologists in Central Africa. There cannot be said to be a solid concensus in support of the syngenetic or epigenetic theory.

Ruwe mine differs from the rest—a shallow synclinal basin as regular in form as is to be found. It was brought into production in 1949 after complete stripping—an 8-year job involving the removal of nearly 25,000,000 tons of waste. Weathering has been intense and much of the copper has been carried down by surface waters into the soft "breccia" below. This secondary ore, excavated by draglines, carries its value in rounded malachite nodules and pebbles. It is dumped into a washing plant near the mine and sluiced down by monitors into rotary cylinders and other disintegrators. Jigging yields a heavy concentrate for direct dispatch to smelters. A lower grade product goes to the Kolwezi concentrator. During the last six years, 10,000,000 tons of ore have been treated for an average 2.0 percent copper, now declining.

Ruwe organization gives evidence of the efforts made by Union Minière to advance its native employees. The mine and washing plant, with a capacity of over 2,000,000 tons a year, are operated without any direct European supervision.

WASTE IS BACKFILLED into mined out synclinal section of the great Musoni mine with Euclid end dump trucks.

MUSONI PIT will be extended in left background to mine the dipping southern limb of syncline to depth of 600 feet.

Mining Program, Long Range

Union Minière executives plan far ahead, as shaft-sinking policy discloses. Stoping problems will constantly demand attention because of the varying dip, the character of the wall-rocks, and the sporadic payability of "R.S.C." parting. Methods of stoping may call for change after experience of working conditions has been gained, as was the case in copper mines of Northern Rhodesia. Kamoto will come first. Here the dip of the ore body may be likened to the path of a dive-bomber—down smoothly at 30° for a distance of 250 meters, then a plunge almost vertically toward the target for 350 meters before turning sharply for home on a horizontal course.

The great Musonoi, Kamoto, and Kolwezi open pits, producing copper oxide, sulphide, and mixed ores of varying cobalt content, will be supported later on by Kambove West (with its own new concentrator) and Musonoi Extension. These mines have many millions of tons available for open pitting before full-scale stoping need be established.

Improvements and economies in the stripping of waste have gradually thrown a more favorable light upon the problem of maximum economic depth before going underground. This depth may be 500 to 600 feet below surface, giving a ratio of 10.0 tons of waste to 1.0 of ore, whereas common depths today may be around 350 feet, at 7 to 1. Nor is it merely a question of cost per ton of ore. Control of grade is better in the open mines than in underground stoping, where considerable dilution and losses of ore have generally to be accepted; not that the open-pit workings are free from such factors.

The last time the company published ore reserve figures was in 1926. It is of interest to recall these figures —5,000,000 tons at 10 percent copper and 54,000,000 tons of oxidized ore at 6.5 percent, in a total of 76,900,000 tons at 6.9 percent. Top-level policy of withholding such estimates is not open for public criticism. It may be suggested, however, that the decision has been eminently sound, especially in the light of modern proposals to introduce rigid world-wide definitions. Any attempt to classify Union Minière ore reserves into "measured," "indicated," and "inferred" or "possible" for purposes of publication would be hazardous and liable to mislead. It was Mons. Robert du Trieu de Terdonck, Union Minière consulting geologist in Brussels, who once observed in open discussion that if reserves were only "possible" or "inferred" they did not yet exist and therefore could not rightly be included in declarations. The authority responsible for Katanga reserves, seeking clarity rather than the fetish of standardization, would certainly require to use the classifications and definitions of his choice. The student of annual reports would be tempted to credit Union Minière with very big resources of 4.0 percent copper ore.

Metallurgical Methods

Concentration and metallurgical methods were covered by 12 pages of the classic report by Union Minière chiefs in MINING WORLD, February 1957. There is little now to add. The Luilu plant, with an initial capacity of 50,000 tons electrolytic copper and 1,750 tons cobalt, will be similar to the Shituru works, which are of 135,000 tons capacity, under pressure. As the result of Shituru experience and of studies by the Research Department, many improvements will be effected—such as the replacement of Pachucas by mechanical agitators—but it is in layout and in system of control that the big advance is being made. Automation will be introduced as far as economically practicable and processes will be centrally controlled.

Native Aptitudes

Increased mechanization and saving of labor is the administrative objective throughout Katanga. The trend is likely to be checked only by the gradual expansion of operations underground, where human skill and experience can never be replaced, in comparable degree, by automation. Mining and geology should appeal to forward-looking young native students of professional ambition, seeking to take advantage of the new University at Elisabethville, center of a world-famed mineral province. So far, the signs are anything but propitious. Mining or geology does not attract, for these occupations mean hard grind, the use of lowly tools in apprenticeship, and even an open shirt, lacking the indispensable "white collar." This antipathy is deep and will become a factor of no small importance to the mining industry in Central Africa. The ambitious native turns avidly to graduation in law or history, economics or other learned subjects of academic dignity. He means to employ these useful mining fellows and not himself to sweat along their rugged professional path. Perhaps the talkative and easy-going tribal chief has set the pattern. By observation or instinct, the native aspirant to power has surely discovered that it is easier to rule a country than to run it.

Open Pit Mining Practices

Open-pit methods are standardized. For waste removal, 60- and 70-ton electric locomotives hauling six, 22- to 28-yard, side-tipping cars, at 2.0 percent gradient, and end-dumper trucks for back-filling and auxiliary work. Dumping of waste over wide surface areas is facilitated by the monstrous 1,000-horsepower, 120-ton track mover and leveler—the "ripense" of German make—which has stood successfully the test of time. All handling is obviated, even the conductor poles being shifted with the track—one foot at a bending.

Ore is transported by 20-ton Diesel trucks, which have to negotiate steep gradients and long hauls. Shovels, electrically operated, range from 3½- to 6-yard Bucyrus-Erie and, like the locomotives, are in radio-telephonic communication with the control room. Thirty-foot benches are carried. Blasting, with chlorate explosives, is usually necessary, though the overburden can be shattered with small charges. Had this overlying ground been consistently softer, the bucket-wheel excavator and conveyor-belt system might have been used. It was carefully considered by consulting engineer Eugene Weberg before its successful introduction into the neighboring Nchanga open pit in Northern Rhodesia.

At Kambove West, the stripping task is too small for electric locomotives and all waste rock will be dumped by Euclids into the famous old Kambove pit nearby.

An innovation in local practice is being introduced at the Kolwezi mine with a double-track incline skipway, at 37°, for waste disposal. In the last two years alone, some 70,000,000 tons of overburden have been stripped in Kolwezi open-pit operations. END.

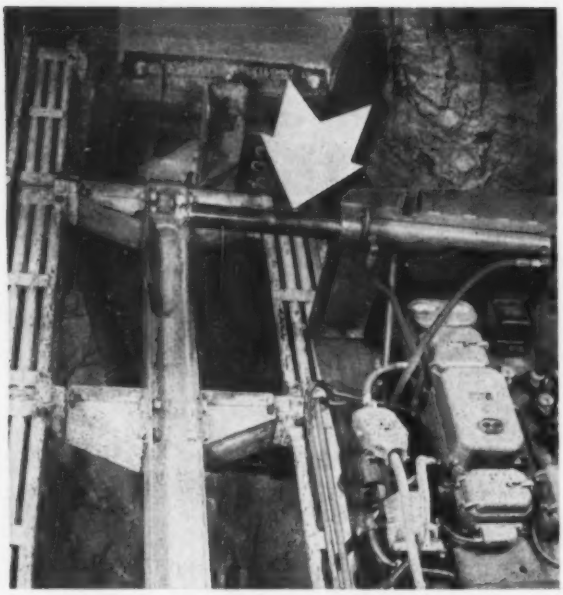
INCLINE SKIP at Kolwezi pit will be used for waste stripping.

EUCLID TRUCKS haul ore from Kolwezi pit directly to the flotation mill.

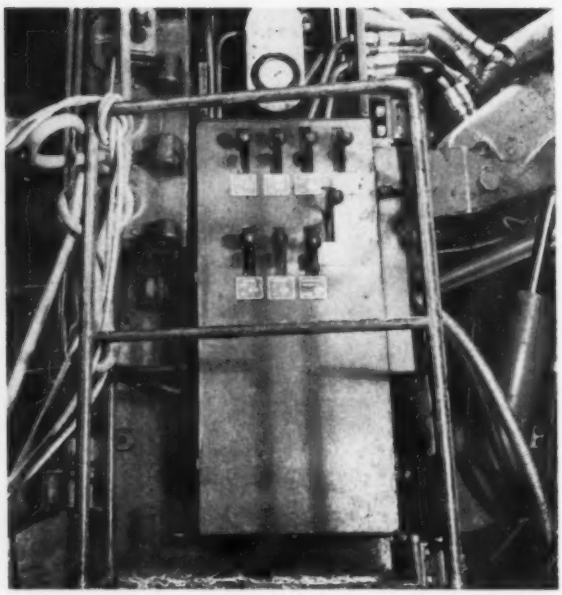
LOADING rotary drill holes at the Kolwezi group of mines. Primacord is used for firing because of electrical storms.

UNION MINIÈRE'S stripping team at Kambove West features United States built electric shovels and Diesel trucks.

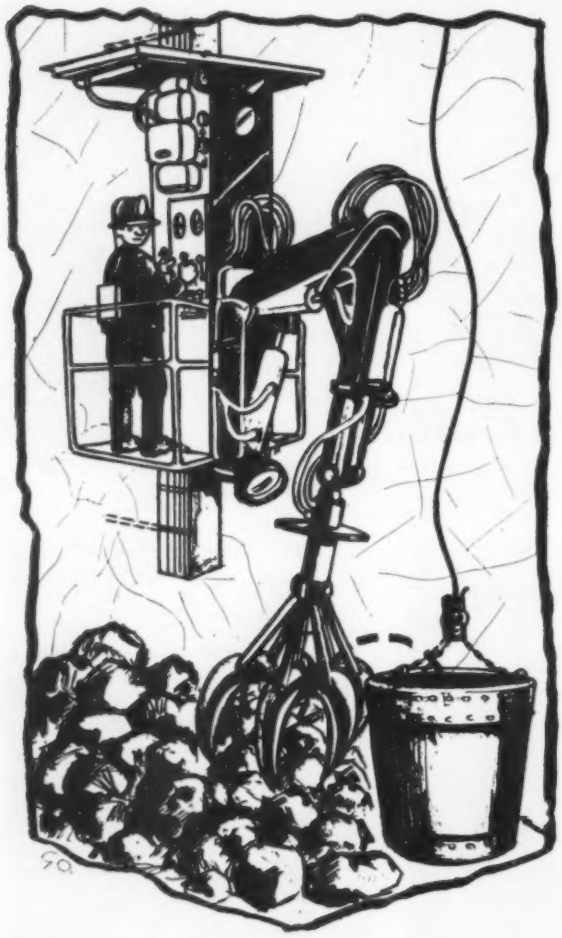
KAMBOVE WEST stripping dump fills far end of mined out Kambove pit.



FOUR HYDRAULIC RAMS, one of which is shown by arrow, are extended against shaft wall to give machine rigidity.



CONTROL PANEL has only eight levers to position machine up and down shaft, and pick up and load muck from bottom.



MUCKING OUT ROUND with Aligrab. Schematic diagram shows operator loading coarse muck into sinking bucket. Note safety hood.

Aligrab . . . . .

By T. Bjornberg,

Engineers at LKAB, Europe's largest underground iron ore mine in northern Sweden, have made many technical contributions to improve mechanization and increase labor productivity in order to raise output and cut costs.

One of the latest Kiruna projects has been the sinking of a small, elliptical-shaped, pilot shaft whose area had to be only 10.8 square meters (equivalent to a 10.2-foot-diameter circular shaft).

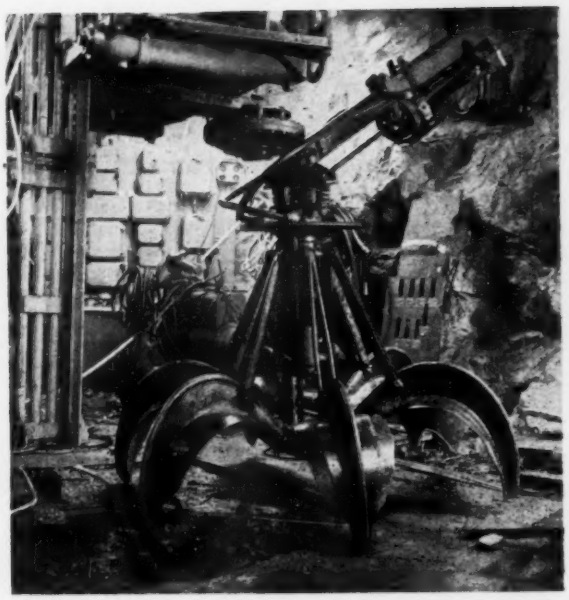
In planning this shaft, the engineering staff had to devise a method to meet the following conditions:

1. Mucking must be completely mechanized with only one man necessary to operate loading equipment.
2. No miner could be on the muck pile during loading.
3. The loader operator would have to be well protected against falling rock.
4. The loading equipment must be self propelled within the shaft.
5. Shaft must have the smallest possible area.
6. Equipment must be as small as possible so as not to fill shaft bottom.
7. Mucking capacity (net loading efficiency) would have to be 17 tons per hour.

It was soon apparent that a great many shafts used different types of grabs for mucking and that they usually hung on wire ropes in the shaft. Efficiency with this type equipment in a small shaft had not been satisfactory. The only way to increase efficiency was to make equipment larger which of course necessitated a larger shaft section. This is exactly what was not wanted at Kiruna where the goal was easier work for fewer men in small shafts.

Studies indicated, too, that efficiency has been increased very little in comparison to hand mucking, despite all the new equipment designed for mechanical mucking. Of course, there has been increased efficiency during the mucking period, sometimes up to 100 percent, but the over-all work cycle efficiency comes out at about the same

KNEE JOINT near middle of boom allows tip to move through 120° arc to spot grab under booth or farthest side of shaft.



OPEN GRAB on station shows how claws can be swung under cab, directly below guide rail, to muck out entire bottom.

New Shaft Mucking Method from Sweden

development engineer, and B. Karlsson, mining engineer, Luossavaara-Kiirunavaara Aktiebolog, Kiruna, Sweden

rate as hand loading efficiency, or, occasionally, 20 to 25 percent greater.

Thus, to obtain high loading efficiency, Kiruna found it impossible to hang the equipment in the shaft on wire ropes. In order to muck with comparatively great force, it was considered mandatory to mount the equipment on the shaft wall. The equipment would have to be easy to mount and to transport through shaft so as not to lose mucking efficiency by doing auxiliary work on shaft bottom.

Choice of the actual digging unit was between a type of back hoe and a cactus grab. The short period available for construction of a unit and its initial testing forced the choice of the cactus grab without definite conviction that this was the best of the two. Hydraulic transmission of power was selected. The greatest problem to solve was how to attach the equipment to the shaft wall.

The solution was the Alimak-Verken raise climber system used in Kiruna to drive raises. This machine has been described by our colleague, Kurt Gustafsson, Kiruna staff mining engineer, in the September 1959 issue of MINING WORLD, pages 52, 53, and 54.

By using the Alimak principle for fastening the equipment to the wall, it was possible to develop a mucking machine to incorporate most of the desired features.

A central operating panel was built on the travelling cage where the operator stands under a protecting steel hood. He controls stabilizing of the cage against rock with four hydraulic cylinders, the raising and lowering of the machine on the guide rail, the swiveling of the boom in a horizontal plane, the raising and lowering of the boom in a vertical plane, the vertical movement of the end of the boom, and the opening and closing of the claws.

The boom is attached to the cage through a vertical swivel joint while the action of the hinged tip of the boom is the same as bending your arm at the elbow.

Movement is imparted by hydraulic cylinders under pressure of 90 kilograms per square centimeter. A 20-horsepower, alternating-current motor, turning at 1,500 revolutions per minute, drives a pump with a capacity of 133 liters per minute to build up hydraulic pressure. The oil tank mounted on cage has a 170 liter capacity with pump built inside tank although electric motor is outside the tank.

A separate electric driven pump (16 horsepower and 50 kilograms per square centimeter pressure) is used to lower and raise the cage and grab assembly up and down the guide rail.

By using two way cylinders, enough pressure is brought to bear that the tines of the grab dig into the muck pile. By being able to handle large boulders in this manner, there is no need for secondary blasting, and fewer holes and less powder are needed per cubic meter of rock broken.

Only 30 meters of standard raise climber guides are needed as the entire mucking unit is hoisted out of the shaft when round is blasted. The top guide section is taken off and bolted to wall at bottom of guide after every round. The operator makes this change before mounting the mucking equipment on rail.

During first stage, one operator and one hoist man, using a 1.7-cubic-foot sinking bucket, achieved a 22-ton-per-hour loading efficiency. This was 11 tons per man hour for the entire mucking and hoisting cycle.

The next stage is to increase efficiency by using two buckets. The solution of the problem of mechanically switching the hoisting cable from bucket to bucket in the shaft boom is in sight. With two buckets in use, the overall mucking and hoisting capacity is calculated at 18 tons per hour, thus, the initial capacity goal will be achieved.

While this method of shaft mucking is not entirely new, the description of the equipment and method is given here in the hope that it might inspire new efforts to increase mucking rates in small shafts. END

MONEY-MAKING METHODS

Overflow Screen at Clayton Mill Brushes Sweep Chips Off Classifier

Cleaning wood pulp and other trash out of a milling circuit is always a problem. Revolving screens, vibrating screens, and fixed screens are all used to separate wood from the ball mill or classifier overflow.

The problem of keeping screens clear for a free flow of mill pulp, however, usually necessitates manual cleaning at frequent intervals.

Clayton Silver Mines, Inc. has built the simple mechanical screen cleaner shown in photograph for its 100-ton-per-day flotation mill at Clayton, Idaho. Here's how it works: classifier overflow, containing floating wood, passes over a fixed screen which catches all trash. Where formerly the mill operator scraped the wood off the screen and threw it into a trash barrel, now screen cleaning is automatic.

At one edge of the classifier overflow, an electric motor drives a six-inch-diameter pulley at slow speed through a gear reducer. At the opposite edge of the classifier overflow, an idler pulley is mounted. A three-inch-wide rubber belt is placed over the pulleys so that the lower section

travels at right angles across the overflow. Heavy scrub brushes with strong bristles are mounted on the belt to sweep the full width of screen pushing all trash ahead off the screen into a catch box.

Double Your Core Splitting Footage

A new hydraulically powered core splitter developed by the geological and engineering staffs of Climax Molybdenum Company splits solid rock twice as fast as hand operated splitters.

The new unit splits 400 feet of diamond drill core per shift into two equal parts at Climax's geological office in Colorado. An automatic core loading device on the machine also contributes to speed of splitting. To fully use the splitting speed of the machine, a new bench was designed and built to hold the incoming core boxes and trays. The company has applied for patent rights to the splitter.

Chief geologist Stewart Wallace foresaw the need for the machine and cooperated with chief engineer, Max Gelwix, in its development.

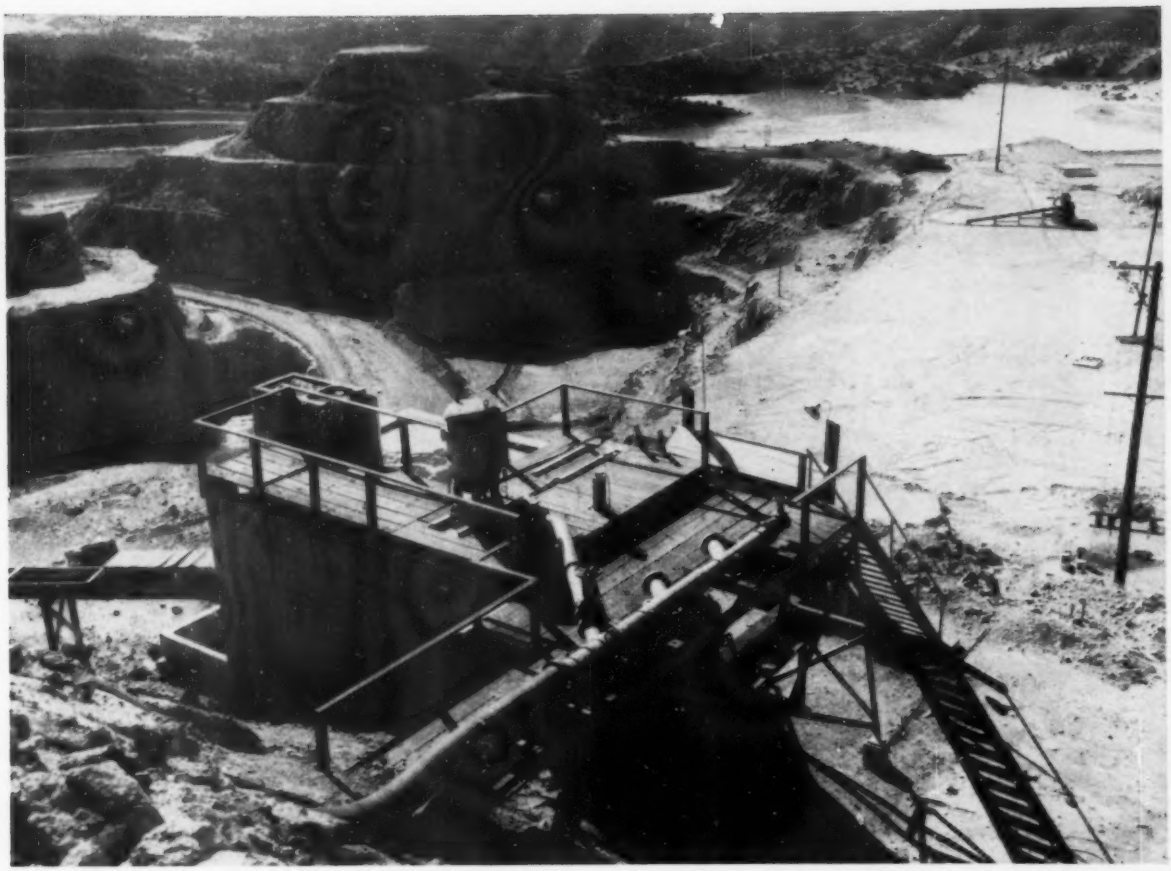
NEW SPLITTER with men who helped perfect it. From right are, Jerry Atwood, operator; Dean Peed, staff engineer who did much of design work; and Bruce MacKenzie, geologist, who designed new core box bench.

Inspiration Copper Uses Metalocks To Repair Cracked Crusher

Inspiration Consolidated Copper Company has used Metalock to successfully repair a cracked arm on its 42-inch gyratory crusher. The crusher was damaged when a shovel dipper tooth was dumped into the crusher in a truck load of ore.

The repair was made by the Metalock Casting Repair Company of Tulsa, Oklahoma at a time scheduled by Inspiration so as to minimize crusher down time.

In making the cold repair, 168 ¼- by ¼- by 2-inch Metalocks were used. They were placed in 15 grooves cut in the 5¾- by 15-inch arm. Alternate grooves were cut from both sides inward toward the center of the casting. It is hoped that the repaired arm will have about the same strength as it did originally. Each of the ¼- by ¼-inch high tensile steel locks has the same strength as one square inch of cast iron.



COPPER CITIES, one of Southwest's most spectacular porphyry pits, still yields copper to acid leaching. Pumping installation in foreground uses Paraline RD lined steel pipe to combat corrosion. One of many uses of plastic by Miami Copper Company.

How New Plastics Solve Acid Water Corrosion Problems at Miami Copper

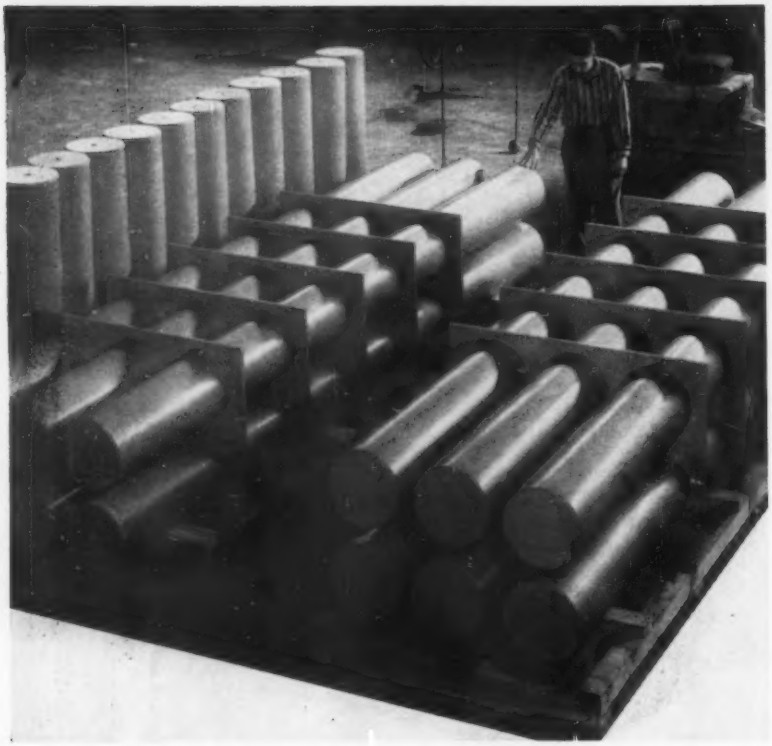
A new construction material—plastic—is being used more and more by mining and metallurgical engineers. At Miami Copper Company, Miami, Arizona, plastics are proving competitive, comparatively trouble free, and versatile, when used selectively and intellegently.

Beginning on a modest scale about three years ago with the first small uses of plastic piping and plastic based maintenance coatings, Miami now considers plastic materials for a wide variety of severe applications, and recently capped its growing list of successes with an uniquely designed pump raft that rides on plastic floats in an acid-water pond.

The plastic raft was originally conceived by R. P. Hughes, mechanical superintendent, who oversees engineering operations. Credit for the final design rests with Art Habich and George Colgate, engineers working in conjunction with Mr. Hughes. The problem facing them was an old one to copper mining: the corrosiveness of the acid solutions used for leaching of waste dumps. Leaching has been in progress at Castle Dome since January 1953. Since the close of normal open-pit mining operations there in December 1953, the water is collected and stored in basins formed during the mining operations. These basins are generally very narrow, and have extremely rocky shores. The water in the collecting basins consists of both ground water runoff and effluent from the precipitation plant. It is weakly acidic and is highly corrosive to mild steel. Water levels in the narrow basins fluctuate sharply with occasional rains, and a summer cloudburst can raise the water level 10 to 15 feet in a few hours. Because of this possibility of flooding, a land based pump was deemed impractical and a floating pump considered to be the only realistic solution.

Miami has proven that plastics have a place in mining operations, if used within prescribed limitations. The Barber-Webb Company of Los Angeles, California was chosen as prime supplier of plastic materials because of its ability to recognize those limitations. It is gratifying to both companies that plastics have been such a good investment in so many situations when placed in competition with more conventional materials. Plastics have shown themselves to be worthy of consideration for some of mining's toughest problems!

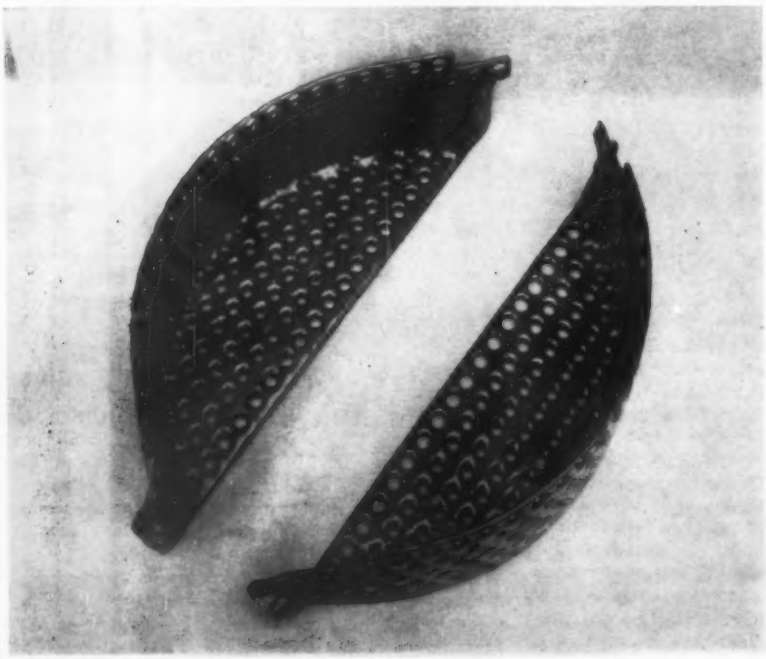
Build Plastic Pump-Raft of Paraline Polyvinyl Chloride Pipe



FABRICATION DETAILS of plastic raft showing how round sections of 1-inch-thick sheet separators were used to cap 12-inch-diameter pipe.

Final design of the raft's floats was based on the best standard plastic extrusion available, 12-inch schedule 40 polyvinyl chloride pipe. The rocky shoreline eliminated the possibility of using a coating material over mild steel because of the probability of scraping or gouging the coating through to the metal. Stainless steel was considered, but the plastic was chosen in preference to stainless on the basis of lower cost and weight. A total of 270 lineal feet of the 12-inch pipe was used to achieve a design buoyancy of 15,000 pounds. Standard pipe length multiples were used to eliminate waste with design incorporating four bundles of pipe, two of nine pieces, each five feet long, and two of six pieces 15 feet long, plugged into air-tight chambers. To further reduce material waste, end plugs were cut from a ¾-inch thick sheet of PVC in such a way that the sheet was later used as spacers for the longer bundles. Ultimately, additional spacers of redwood were also used on the 15-foot long bundles. Redwood was used exclusively as spacers on the shorter bundles. Responsibility for fabrication of the plastic floats was entrusted to Barber-Webb, which also assisted in some of the design work. Plastic material used in the fabrication was

Paraline Rd, A Vinyl Plastic, Used For Non-Abrasive Pipe



PUMP INTAKE SCREEN made from perforated mild steel plate has been made corrosion proof by ¾-inch-thick Paraline coating.

Plastics are also used in other places by Miami. The use of plastic based maintenance coatings has shown important savings. By testing Miami determined that Barber-Webb's Paraline 24 air dry vinyl was most suited. Some of its uses include the coating of the interior of flotation cells in an acid circuit, pump interiors, and various structural members, particularly those exposed to corrosive splash or fumes. Savings are realized chiefly through the high performance characteristic of the coating, which has relieved the need for the constant repainting projects that were the rule when oil based coatings were in use.

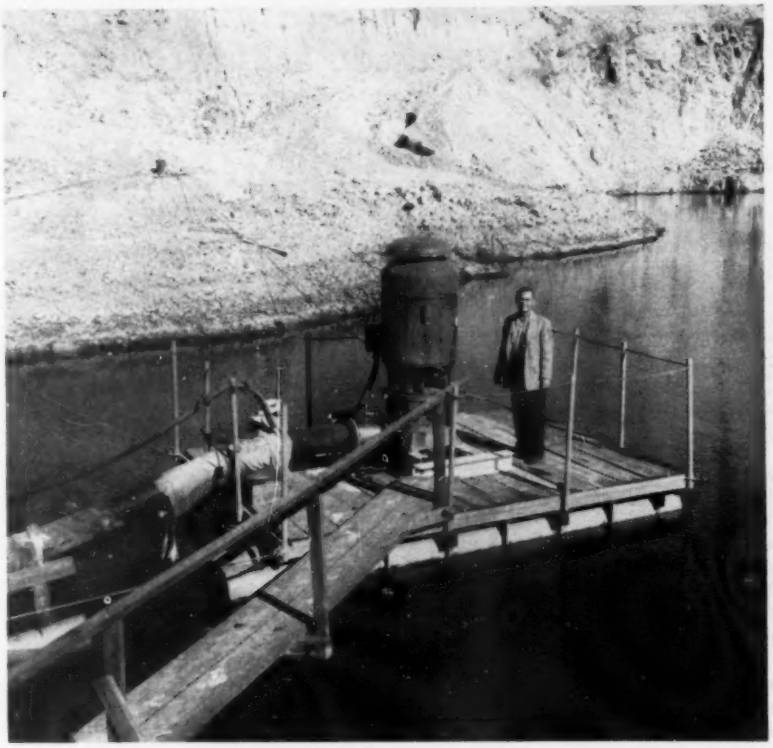
Paraline RD, a vinyl plastisol, is also used by Miami, primarily as a pipe lining material. The plastisol, shop applied by Barber-Webb, is a heavy liquid at the application stage, which, when cured by baking, forms a thick, homogeneous mass similar in appearance to rubber sheet linings. Because it is applied in a liquid form, resultant labor savings make it generally lower in cost than equivalent thicknesses of rubber. It is superior to rubber in chemical resistance, is seam-

and Sheet To Float Indefinitely in Copper Cities' Acid Water

Barber-Webb's high impact Paraline PVC. Fabrication detail, in addition to plugging and air testing the pipe ends, consisted of properly cutting spacer sheets, and assembly of the longer pipe bundles. After assembly, ¼-inch PVC sheet stock was formed and solvent welded to the outside circumferences of the pipe on both sides of the spacer sheets to keep the spacers firmly in position.

As finally assembled by the Copper Cities division's mechanical department, the five-foot bundles were positioned between the 15-foot bundles to accomodate a rectangular deck frame, and in such a way that a section wall for a vertical pump was formed in the center of the raft. The deck frame, decking and other superstructure were all constructed in the Copper Cities shops, and all metallic components coated with a minimum of three coats of Paraline 24, an air dry vinyl coating material, also a product of the Barber-Webb Co.

The raft now floats a five-inch, type VMS, vertical Hazelton pump driven by a 100-horsepower Allis-Chalmers electric motor. The unit delivers 700 gallons per minute against a 350-foot head. The discharge hose is supported with floats so as to maintain a 15-inch freeboard.



PLASTIC RAFT floats high above acid waters in Copper Cities pit. Pump, motor, fittings etc. weigh more than 9,000 pounds.

Linings, and Coatings For Irregular Shaped Metallic Parts

less, and can be applied to practically any metallic shape or structure at an uniformly low cost.

It is used by Miami, particularly for non-abrasive pipe applications, in preference to both stainless steel and rubber lined pipe. Because of the application method, important, money saving design considerations are possible, including one piece fabrication of multiple pump headers, and reduction in size through a pipe length. It has found wide use at Miami in leach-precipitation work, both underground at Miami and in the open-pit leaching at Castle Dome.

In its precipitation operations, Miami finds it necessary to protect pump impellers from floating debris by screening the pump intake areas. These screens were customarily made of stainless steel, either of mesh or punched plate design. The stainless however, became clogged with iron salt scale, and created a continual maintenance problem. By designing with lining tolerances in mind, Miami was able to have the screens constructed of mild steel and coated by Barber-Webb with Paraline RD. The first such screen has been installed about two years. There has been no scale formation and no maintenance required, since installation. Since then, Miami has ordered many more screens of various sizes and descriptions. All that have seen service to date have been absolutely trouble free.

Why Rigid Pipe Will Be Cheapest on Long-Term Basis

Miami also makes extensive use of rigid plastic piping when it can be proven economical. One example is ontstanding since plastic replaced cheaper materials.

PVC was used to replace much lower priced cement-asbestos pipe simply on the basis of total installed cost. An eight-inch line, 940 feet long, was required between a collecting dam and a sump at the Castle Dome leaching site. While cement-asbestos would normally be used for the corrosive and pressure conditions of the line, the terrain over which the line had to be laid was such that installation costs looked prohibitive.

Eight-inch schedule 40 high impact PVC was furnished by Barber-Webb which also furnished one of its technicians to assist and supervise the Miami personnel in field bending of the pipe to conform to the rough terrain. Because the line is exposed to the weather and a considerable temperature variation, possible expansion of the PVC was an important problem. To combat the expected expansion and contraction of the line, the pipe was coupled by banded on lengths of rubber acid hose, rather than with normal plastic fittings. The field bending was accomplished under the most adverse conditions possible, on a windy, cold day, and without damage to the pipe.

The line has been in continuous trouble-free service since December 1957. END

Competition in Iron Ore . . .

Discussed at University of Minnesota Symposium

Lake Superior No Longer Dominates Ore Supply Picture

Despite many advantages that foreign iron ores now have the Lake Superior mining companies are not going to lose their markets. In fact, plans, time, money, and energy are all being directed to make the Lake Superior mines prosperous reported John S. Wilbur, vice president of ore sales for Cleveland-Cliffs Iron Company.

Efforts will be intensified to increase ore quality to make up for deficiency in analysis with foreign ores. Ores will be properly sized, all the large chunks will be eliminated and a uniform top size will be produced. Ore grades will be as uniform as possible. Ores will be tailor made for customers to meet their exact specifications.

Even more concentration will be made on mining technology and research to examine every possible way of reducing mining costs. All phases of transportation costs from mines to furnaces will be investigated.

And last, but not least, the companies are certainly going to explain the situation very carefully to the workers and the Union that represents them. Now, because of foreign competition, the mining company cannot pass on regular increased costs in the form of higher prices as was formerly possible.

Here are some of the present advantages that foreign ores now have, according to Mr. Wilbur, that make the competitive position of Lake Superior iron ores not good.

Today there is an oversupply of iron ore partly caused by increased demand from the European steel industry, but mainly caused by the rush of the U. S. steel industry to supplement what used to be known as dwindling supplies of standard Lake Superior ores. The new projects, many involving U. S. iron mining companies, required large capital expenditures. There is, therefore, a tendency to keep the foreign properties operating at a high rate in order to get the invested capital back as fast as possible. If the foreign mines operate at high production rates, something has to give. Lake Superior mines with greater flexibility and relatively lower investment have taken it on the chin.

In the U. S. automatic, annual inflationary cost increases have forced domestic mining costs up to a point where it has been profitable to open up foreign deposits. Labor costs are higher in the U. S. In the Lake Superior area, state and federal taxes are a major cost factor. The latter two conditions are not prevalent at many of the foreign deposits. Quality of

much of the foreign ore is superior to the ore of the Lake Superior district. For instance some of the South American ore is of very high grade, requires no treatment prior to shipment to meet a 62 to 65 percent grade. Certain of the Canadian lower grade ores do not require as fine a grind as the U. S. taconites to yield a product suitable for concentration. Also a great deal of the foreign ore is favored by location and geography with water transportation and low cost ocean shipping. Shipping a ton of Lake Superior ore 59 miles by rail from Ashtabula to Youngstown costs about half as much as the cost of shipping a ton of ore 4,200 miles from Liberia to Baltimore.

Minnesota Tax Structure Puts a Penalty on Most Ores

Minnesota still adheres to some tax laws that are out-moded and, what is more to the point, make Minnesota ore companies non-competitive in the world market. These tax laws make it cheaper to develop low grade ores elsewhere. Property valuations should be equalized. All of these blunt statements were made by Richard W. Whitney, vice president of operations, Hanna Mining Company. He added the following:

While the Lake Superior region is still the dominant area in the world's iron ore industry its degree of importance has been diminishing steadily for 10 years and that trend is destined to continue in the future. In the short space of 10 years, the iron ore industry ceased to be a domestic enterprise and became a world wide ore.

An iron ore company today can seriously examine iron deposits anywhere in the Free World and can investigate shipping its products to almost any market in the Western Hemisphere or in Europe.

Our future is tied directly to the consumption of steel. We must always be cognizant of the increase in per capita use of steel and also in the world population growth. The steel industry has more than held its own insofar as inroads made by plastics and aluminum.

There is no shortage of iron ore in the ground throughout the world and the ores may come from many of our states as well as most of the provinces of Canada and a half dozen other nations.

Even though we go further and further away to develop foreign ore sources, we must make every effort to be competitive in the Lake Superior district.

Ungava Emerges as One of World's Great Iron Sources

"The Ungava geosyncline of the Quebec-Labrador region of Canada may possibly contain half of the potential Canadian iron ore reserve. . . . It is anticipated that approximately 80 percent of the ore produced in Canada during the next 50 years will be mined from this area."

The above statements were made by Gordon A. Gross of the Geological Survey of Canada. Other deposits in Canada are more widely scattered and are more diverse in type and quality.

The tremendous expansion in iron ore production in Canada during the past 10 years and its impact on the Canadian economy can be appreciated when it is realized that production rose from 1,193,968 long tons in 1948 to 19,885,870 long tons in 1957. Over 62 percent of this ore was produced in the Knob Lake area of the central portion of the Ungava geosyncline. Forecasts of Canadian iron ore production indicate that by 1965, the annual ore production will be over 55,000,000 tons of direct shipping and concentrated ore. The existing annual production capacity at Knob Lake is about 14,000,000 tons. Another 20,000,000 tons of concentrate will likely be produced from the Ungava belt when present construction projects are completed.

The proven and indicated ore reserves in the Ungava belt amount to 4,800,000,000 tons of concentrate obtainable from 12,000,000,000 tons of itabirite. Itabirite is an ore from a medium to coarse grained iron formation that consists of a mixture of magnetite, hematite, quartz, iron-silicate, or iron carbonate containing 30 to 38 percent iron.

Geologically Ungava ore can be divided into three principal geological divisions. The ores of the central division are mainly of one distinct type consisting of mixtures of hematite and goethite that grade about 55 percent iron. Iron Ore Company of Canada has been active in this region and made the first shipment in 1954. Annual production capacity of 12,000,000 tons of ore was anticipated during the construction phase, but planning included provisions for further future expansion to 20,000,000 tons of ore per year.

The northern and southern divisions of the Ungava belt contain extensive deposits of the itabirite type, so-named because of the similarity to certain of the Mines Gerais deposits in Brazil. Development now taking place in the southern division will result in an installed annual capacity for 15,000,000 tons of iron ore concentrate by 1962 and 20,000,000 tons by 1965.

South American Iron Ore Industry Is Young, Vigorous

Proven ore reserves are so large that the huge potential medium grade deposits will not be touched for a long time said Horace T. Reno, assistant chief of the ferrous metals branch of the United States Bureau of Mines. Co-author Sumner Anderson, Latin American specialist, U. S. Bureau of Mines, and Mr. Reno cited the figures below which confirm the fact that South America will become a growing power in the iron ore picture:

Direct shipping ore reserve: 20,000,000,000 tons
Aggregate reserve: 60,000,000,000 tons
Present producing capacity: 32,000,000 tons per year

But the factor that makes this picture even more amazing, is that only a very small part of the total area of South America favorable for iron ore deposits has been reliably evaluated. Most of the large mines now in production were developed to serve the United States. Now, however, ore is produced in South America for shipment to West Germany, United Kingdom, Italy, Netherlands, Czechoslovakia, Poland, Austria, France, Belgium-Luxembourg, and Japan.

Brazil, according to Messrs. Reno and Anderson, has by far the largest iron ore reserve of the South American countries. Among countries of the world, it may well rival the huge reserves of India. Quadrolatero Ferriferro deposits of Minas Gerais State consist of metamorphosed sedimentary beds of banded specular hematite-quartz. The Minas Gerais iron deposits contain an estimated 16,000,000,000 tons of hematite ore, known locally as itabirite, ranging from 50 to 60 percent iron.

An estimated 35,000,000,000 tons of itabirite potential ore also exists in Minas Gerais, according to the authors.

Current Brazilian production now amounts to about 5,000,000 tons of ore per year of which 3,500,000 tons is for export. Within the next five years exports will increase to 7,000,000 to 8,000,000 tons annually and may reach 10,000,000 to 15,000,000 tons if new transportation facilities are built.

Venezuelan reserves of iron ore probably rank second in size and grade among the reserves in the nations of South America. Proven reserves are 1,000,000,000 tons of high grade ore and probably reserves amount to 3,000,000,000 tons. Current production capacity is about 18,000,000 tons per year. Most of this capacity originates from the Cerro Bolivar deposit of Orinoco Mining Company, a U. S. Steel subsidiary, and the El Pao deposit of Iron Mines Company of Venezuela.

Chilean reserves probably rank third in importance in South American countries. Reserves are estimated at 200,000,000 tons of high grade which are immediately available to support the companies presently producing. Current capacity to produce ore for export is 6,000,000 to 7,000,000 tons per year. New mines now being developed will bring this capacity to about 9,000,000 tons a year by 1961. In the next few years the huge El Laco deposits of Compania Minera Santa Fe may undergo development.

In Peru there is a readily available reserve of iron ore of 400,000,000 to 500,000,000 tons. Exports currently are about 3,000,000 tons per year and will probably increase to 6,000,000 tons annually. END

PRODUCTION EQUIPMENT PREVIEW

For data on any item on next three pages use the inquiry card opposite page 48

Tandem Scraper System Developed by LeTourneau-Westinghouse

Tandem concept opens an entirely new era for earthmoving because capacity can be doubled or halved at will, say engineers from LeTourneau-Westinghouse Company. The system does offer great flexibility because various prime movers can be coupled to any of several combinations of scrapers in tandem for tailoring to job conditions. One hitch pin forms the mechanical connection, while quick connect plug-ins provide the hook-up for electric cables and air hoses.

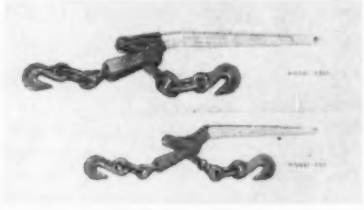
L-W engineers report that the tandem arrangement does not call for a more powerful pusher. Because the scrapers are loaded one at a time, loading resistance is said to be about the same as it would if there was only one scraper behind the prime mover. The tandem arrangement is not new. In the past, however, the system was hampered by awkwardness and lack of maneuverability due to the extreme length and the complication of running wire cable from prime mover to power control unit on the rear scraper.

On the new system electric controls for the rear scraper are used. Maneuverability problem is solved by dispensing with the front axle and wheels of the second scraper and letting it ride piggyback on the rear of the front scraper. This has shortened overall length, permits second scraper to turn a full 90° in relation to the front scraper.

Almost all electric rigs built since 1947 can be tandemized. The job reportedly can be done in the field at modest cost. **Circle No. 21.**

New Sump Pump

The Gorman-Rupp Co., announces the addition of the Model 12B2, 2-inch suction and discharge, sump pump, to its line of self-priming centrifugal solids handling pumps. According to the company the exclusive impeller design of this model, permits the passing of spherical solids up to 1-¾ inches in diameter. The unit mounts high and dry, with only the suction in the sump. Removable endplates are featured for quick, easy inspection and maintenances. Capacities range from 40 to 220 gpm. Three, 4 and 6-inch sizes are also available. Circle No. 17.



Drop Forged Load Binders

The extra strength and safety factors of drop forged metal parts are present in this line of binders now available from Canton Mfg. Co., Canton, Ohio. Six models are available (priced from $7.60 to $14.50). Each features intentional "beefed up" design and construction of each integral unit. Hot drop forging and heat treating of each part before assembly further guarantees utmost safety in load transport and manual operation. Circle No. 13

New Underground Haulage Unit

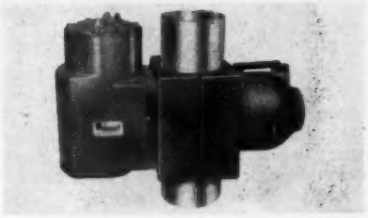
The Getman Ore Carrier, developed and manufactured by Getman Brothers of South Haven, Michigan, is now being distributed throughout the United States and Canada, and ready to be exported to all free world countries. This newest Getman Ore Carrier has been approved by the U.S. Bureau of Mines.

The model CD-4 has an overall length of 15'6", overall width of chassis 96", overall height 56", with a capacity of 85 to 110 cubic feet. Powered by a Continental Diesel engine, the unit has a turning radius of 11'6", and has speeds from 1 to 15 mph in forward or reverse. For further information circle No. 9.

Density Gauge Continuously Monitors Fluids or Slurries in Pipelines

Used on pipes through 8 inches in diameter, two new density gauges are available for measuring specific gravity or percent solids of pulps from The Ohmart Corporation. Model PGV and PG both utilize a point source of radioactive material mounted in a safety shielded holder on one side of the line, and an Ohmart measuring cell on the other side.

The cell detects radiation energy in proportion to the density of the material flowing past the gauge, and change it into an electrical signal which is amplified and fed to a recorder or controller for actuating pumps or valves. The gauge is said to be suited for hazardous locations since it does not contact the material being measured and because housing is rugged. Circle No. 46.



New Features on Le Roi Rotary

The addition of a number of new features on its model 125RG2 portable rotary compressor, without an increase in price, has been announced by Le Roi. Now included on the 125 cfm, gasoline driven two-stage units are three safety features usually found only on larger machines. They are:

1. a cut-off switch that automatically shuts down the compressor if engine oil pressure drops too low;
2. an automatic dump valve that instantly releases air pressure in receiver when compressor is shut down. This eliminates the possibility of oil backing up into the air-end. Operator no longer must remember to manually blow down receiver each time he turns the compressor off;
3. a non-wearing orifice, located in the receiver outlet, assures proper air-end oil cooling by holding 40-pounds pressure in the receiver.

A high temperature switch that immediately cuts off the engine if temperature of the air-oil mixture in the air-end exceeds 230° F., as well as an air receiver safety valve, were previously included. For additional information on further new features circle No. 20.

Shovel Loader Attachment

"GraderloadeR," a new one cubic yard shovel-loader attachment for Caterpillar Motor Graders, was recently introduced by Marting Co., Kewanee, Illinois. Designed for operator convenience, it mounts on the front of the grader, allowing full-vision during loading or dumping.

Once the mountings are added to a grader, the "GraderloadeR" can easily be installed or removed in minutes. Using existing connection points on the grader, the loader unit quickly attaches to the top and forward scarifier mounts. Two bolts and a transverse pin secure the unit to the grader frame without interfering with scarifier or other grader operations. Because of its front mounting, the loading unit bucket can be seen by the operator at all times, without turning around in the seat. Mounting pins with built-in grease reservoirs are used at all points of movement to insure long life and reduced metal wear. Quick-connect hydraulic couplings are used for fast line hook-up. Circle No. 11

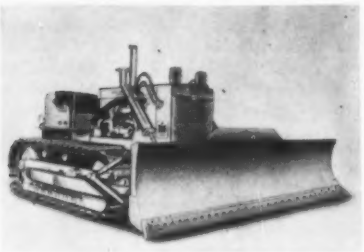
Lake Shore Tank Creates Dust-Soaking Fog, Doubles as Fire Truck

High pressure fogging for dust control plus application as auxiliary fire fighting equipment, has been designed into a single tank unit by Lake Shore, Inc. Developed for heavy service over rugged terrain, the Lake Shore tank truck is built with both horizontal and longitudinal baffles and bulkheads to prevent sudden load shift. High pressure fogging equipment is stored in a nested compartment in the trailer nose for safety and cleanliness.

The trailer unit uses a straight centrifugal pump with an output of 120 gpm at pressures of 120 psi, producing high density fog which is dispersed through nine nozzles at the rear of the tank unit. All piping has been contained within the tank except for the discharge manifold at the rear. The tank has a low center of gravity, and has a capacity of 3,800 gallons. The fogging action permits more wet coverage per gallon of water on mining roads, since the fine water spray, without additional wetting agents, actually wraps itself around the particles of dust. The pump is powered by a choice of either Diesel or gasoline engine, operated by remote control from the truck cab. Circle No. 14.

New Dozer Blades By IH

Four specially-designed blades for use with the new International Harvester TD-25 Diesel crawler tractor, now are in production. The direct-lift hydraulic bulldozer blade and the direct-lift cable bulldozer blade, with cutting edges of heat-treated, high-carbon steel, have a heavy-duty, arc-welded, box-framed, moldboard construction. Tilt is easily adjustable to 18 inches between blade ends, and there is a maximum pitch adjustment of 10 degrees. Weight of the hydraulic bulldozer blade is 8,720 pounds, and that of the cable model 7,950 pounds. Blade length is 12 feet, three and three-quarter inches. Height is 49 inches. The direct-lift hydraulic Bullgrader and direct-lift cable Bullgrader blades also have cutting edges of heat-treated, high carbon steel, and the same construction as the dozer blades.



Bullgrader blades are easily angled from straight to 25 degrees right or left, and tilt is quickly adjustable to 12 inches between blade ends.

The design of the Bullgrader blades virtually eliminates the wearing action of the end plates when pioneering, side casting or cutting into a bank. Weight of the hydraulic Bullgrader blade is 9,500 pounds, with the cable Bullgrader blade registering 9,820 pounds. Blade length is 14 feet, four and one-quarter inches for the hydraulic model and 14 feet, four and one-half inches for the cable version. Height of the blades is 44 inches. Circle No. 10

New Tractor in Production

Euclid Division, General Motors Corporation reports that the Model C-6 has 211-net-horsepower and a Torqmatic drive consisting of torque converter and semi-automatic transmission that eliminates the master clutch.

Other features include: rear-mounted cooling system said to result in cleaner and closer mounting of front end attachments; a front equalizer bar that gives vertical and lateral support without the usual cross braces; fewer lube points than in other crawlers of comparable size. Circle No. 56.

Field Detector Positively Identifies Beryllium

A detector for field exploration of Beryllium is being manufactured and marketed in the U.S. by Nuclear Corporation of America's Western Division. The beryllium detector can easily be taken into the field by geologists for exploration and examination of beryllium deposits. Called the "Berylometer," the detector makes practical use of a well-known nuclear reaction to detect the presence of beryllium in rocks or specimens and offers a rapid method of assaying. Within the Berylometer is Antimony 124, a pile produced radioisotope with a sixty day half-life which serves as the source of gamma radiation. When beryllium in any chemical combination is bombarded by gamma rays having an energy higher than 1.66 Mev, photo neutrons are emitted. About 76% of its gamma radiation is above the 1.66 Mev activation energy necessary to bring about this transmutation.

The detector also includes a scintillation counter, which has a neutron detection efficiency about twice that of the enriched BF_3 tube commonly used in neutron detectors. A Sb 124 source, sealed in a metal capsule, is fixed in a cavity on the lower side of a lead shield that is attached to the base of the instrument while it is in operation. When the instrument is not being used, this shield is detached and deposited in a lead "castle" thus conforming to safety regulations. As a further safety measure, the Berylometer is suspended from a pole about eight feet long and carried between two men during normal field use. By this means, the operators maintain a safe distance from the gamma radiation source which is directed downwards.

In operations, the Berylometer is set down on any rock formation and the presence of beryllium is detected by means of earphones worn by the rear man in the team who directs the work. For quantitative measurement or for assaying of samples, however, the earphones are replaced by a small portable counting register which automatically records the neutron count. Total weight of the Berylometer is ten pounds and with the shield attached is about 25 pounds. The "castle" though, weighs an additional 80 pounds but is left during field operations in camp, or in vehicle. There is only one discriminator control knob for operating the instrument, besides the on-off-switch, and it is set at a point just beyond where the gamma rays from the source are cut off or reduced to a background count of three or four per minute. This can be accomplished because the scintillations in the phosphor caused by the gamma rays from the Sb 124 source are less intense than those caused by neutrons. According to the company, the detector provides the prospector and exploration geologists with an instrument that can positively identify beryllium in any form. The instrument has been approved for use in the U.S. by the Atomic Energy Commission. Users must be licensed by AEC. Isotopes Specialties Co., part of Nuclear Corporation of America, provides a training program for Berylometer operators. Circle No. 3

Nylon-Plastic Conveyor Belt

The Russel Mfg. Co., Middletown, Conn., announces a new concept in a conveyor belt. Made of heavy nylon yarn, it is loomed to produce a complete belt at one time. The space betewen the yarns is filled with a specially compounded P.V.C. Polyvinyl Chloride plastic. These rope-like yarns separated by P.V.C. plastic, produce a light-weight, high strength, fire-resistant material which according to the company out-performs conventional rubber conveyor belting.

MORE NEW EQUIPMENT . . . AND NEW LITERATURE

HYDRAULIC EQUALIZER: Lake Shore, Inc. has recently introduced a new hydraulic equalizer assembly for mine skips and cages for use with multiple ropes. The unit automatically equalizes the multiple rope suspension and is used with Koepe type hoists. According to the manufacturer, the unit will compensate for a larger amount of variation in rope lengths than common types of linkage systems. For additional information circle No. 34.

PAYSCRAPER, PAYWAGON CATALOG: The new International Model 495 Payscraper and Model 495 Paywagon are thoroughly detailed in a two-color, 36-page catalog available from International Harvester Company. Payscraper capacities are 34-cubic-yard heaped and 24-yard struck. Paywagon has capacities of 40.5 cubic yards heaped and 27 yards struck. Circle No. 33.

COMPLETE DETAILS on M-S-A Porto-Power hydraulic rescue equipment are provided in a bulletin now available from Mine Safety Appliances Company. The brochure describes operating principles of the equipment, which combines a hand-powered hydraulic pump and hydraulic ram to convert manual power into a maximum of 20 tons power applied to rescue operations. Circle No. 2.

SHAFT SINKING MACHINES: Information is now available on the new Alimak multiple-finger type shaft mucker. The units travels on guide rails bolted to the shaft's wall, and which contain all air and water lines. The hydraulically controlled mucking units can be directed rapidly and positively to any position in the shaft. According to the manufacturer, average loading time is about 5 minutes to fill a 2¼ yard bucket. Circle No. 25.

DIESEL ENGINES made by International Harvester Company are described in a new folder which covers 24 different models. Circle No. 44.

LEAD BARITE-FLUORSPAR flotation is discussed in a new flowsheet study released by Denver Equipment Company. This study illustrates the entire process from the coarse ore bin to the dryer. Circle No. 1.

SURVEYORS SERVICE COMPANY, 2201 South Grand Ave., Los Angeles, California, has been appointed by Wild Heerbrugg Instruments, Inc., as western distributor for all Wild surveying instruments. Complete stocks will be maintained in Los Angeles, as well as authorized repair services. Demonstrations by fully qualified field personnel of Surveyors Service Company will also be available.

STERLICONE MULTI SHIELDED drip-proof motors are the topic of discussion in a bulletin published by Sterling Electric Motors, Inc. The bulletin illustrates five outstanding design features and explains in detail how these motors can replace totally-enclosed motors in many applications where adverse conditions of moisture, humidity, dust, oil and chemicals prevail. Circle No. 22.

DIAMOND BIT CATALOG: Detailed information, including specifications, assembly data and prices, on Asco diamond drill bits, is presented in a new illustrated catalog from Anton Smit & Co., Inc., New York. Circle No. 23.

A NEW SILICON RECTIFIER conversion unit that eliminates costly maintenance of mechanical rectifiers and replacement of tube-type rectifiers on electrostatic precipitator power supplies has been introduced by General Electric's High Voltage Specialty Transformer Section. The newly developed conversion units are for use in high voltage D.C. power supplies on electrostatic precipitators that collect fly-ash and dust particles in industrial plants and electric utility generating stations. Circle No. 28.

PRESTRESSED CONCRETE: A new 56-page booklet, No. P-110, illustrating typical uses of prestressed concrete, together with technical data, is now available from Leschen Wire Rope Division. The new booklet explains basic principles of prestressed concrete and is designed to serve as a technical handbook. Circle No. 30.

FLIP-TOP BOX for multiple-use first-aid units is described in a bulletin issued by Mine Safety Appliances Co. Circle No. 31.

PIGSKIN SAFETY SHOE: A new lightweight Pigskin safety shoe, said to save a pound or more per pair over conventional safety oxfords, has been introduced by Haus of Krause, Rockford, Michigan. Named the Sprotlite model, the new shoe incorporates customary steel toe protection, with casual sport shoe styling. Circle No. 32.

FLYWHEEL POWER TAKE-OFF has been introduced for heavy duty trucks of International Harvester Company. The unit delivers 88 percent output of engine speed through output shaft and is said to be capable of a sustained 75-horsepower output. Circle No. 47.

POCKET GUIDE on Airco arc welding electrodes is now available from Air Reduction Pacific Co. New products and new engineering data have been added to the company's most recent edition of this 64-page guide. Circle No. 24.

List information you want MINING WORLD to obtain for you on this card. WE'LL DO THE REST. No postage necessary if mailed in U. S.

FEBRUARY 1960 **NOT GOOD IF MAILED AFTER MARCH 25**

CIRCLE NUMBERS OF ITEMS YOU DESIRE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	61	62	63	64	65	66	67	68	69	70
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	71	72	73	74	75	76	77	78	79	80
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	81	82	83	84	85	86	87	88	89	90
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	91	92	93	94	95	96	97	98	99	100

Also send further free information on the equipment advertised on pages:

Pages .....; Product ..... Manufacturer .....

Pages .....; Product ..... Manufacturer .....

Company or Firm .....
(Print Clearly)

To Attention of ..... Address .....

City ..... Zone ..... State ..... Country .....

IMPORTANT: Following information must be given to insure prompt reply:

Nature of your firm's business .....
(Rank as: mining, consulting engineers, government, etc.)

Your exact title, job or position .....
(Rank as: mine supt., mill foreman, mining engineer, managing director, etc.)

.....

Use this section to subscribe only

Sign here if you wish to subscribe to MINING WORLD .....

☐ 3 years, $8 ☐ 2 years, $6 ☐ 1 year, $4 (Add $1 per year if outside U.S., Canada, Latin America)

SWIVEL PILER can increase conveyor storage range of stockpiled material up to 10 times reports Stephens-Adamson Mfg. Co. The unit consists of a centrifugal thrower unit complete with hopper and swivel joint. It is mounted beneath the discharge end of conveyor. Circle No. 39.

CHAINS for conveyor systems are described in a comprehensive bulletin that is useful as a selection guide for this type of equipment. Published by Moline Malleable Iron Company, many specifications are included. Circle No. 40.

NEW POWER SHOVEL equipped with 5-yard bucket, 35-foot boom and 26-foot 10-inch dipper handle has been introduced by Construction Equipment Division, Baldwin-Lima-Hamilton Corporation. As a crane Type 1800 has a 112-ton lifting capacity. Circle No. 41.

MATCHING TUBES TO JOBS is the title of new bulletin prepared on seamless tubing by Babcock & Wilcox Company. The bulletin should be useful to product and design engineers. Circle No. 42.

WALL CHARTS: A colored wall chart from Amsco gives step-by-step instructions for replacing tractor grouser bars. It also includes detailed information for ordering manganese or carbon steel bars covering all leading makes of tractors. A similar chart provides instruction and specifications covering two types of dipper tooth repointer and repointer bars. Circle No. 35.

URETHANE PUMP IMPELLAR was reported to have outlasted a natural rubber counterpart at a Canadian uranium mill, according to E. I. DuPont De Nemours & Company. Pumps were handling a slurry of 60 percent solids, 60 percent minus 200 mesh, and pH of 1.8. Circle No. 53.

WALL CHART shows at a glance the gaseous equivalents of one through 5,000 gallons of liquid oxygen, nitrogen and argon. Prepared by Cryogenic Division, Ronan & Kunzl, Inc., the approximate number of high pressure cylinders is also shown. Circle No. 50.

NEW BULLETIN details the features and performance capabilities of the W-10 Terraload'r, made by J. I. Case Company. The operation and construction of the 6,500-pound capacity rubber-tired tractor is well illustrated. Circle No. 51.

JAW CRUSHER: Operating advantages of A-1, double toggle, crusher made by Allis Chalmers Mfg. Co. are outlined in a new bulletin. This unit is said to be up to 2 percent longer and has up to 35 percent deeper crushing chamber. Circle No. 52.

SHAFT MOTION INDICATOR made by Bin-Dicator Company is now available in an explosion proof model. The unit provides protection for feeders, conveyors, etc., and indicates speed changes. It is effective on shaft operating speeds of 10 to 150 rpm. Circle No. 49.

TRACTOR SHOVELS: Trojan Division, Yale & Towne Mfg. Co. has prepared two brochures on Model 134 and 164 tractor shovels with carrying capacities of 1 to 1⅜ and 1½ to 2 yards respectively. Circle No. 45.

CORROSION CONTROL: New 38-page bulletin on rust and corrosion control is believed to be one of the most comprehensive treatises ever assembled on the subject. It is available from Rust-Oleum Corporation. Circle No. 55.

ELECTRIC SCREENS are described in detailed 24-page bulletin by W. S. Tyler Company. Descriptions are confined to Hummer screens said to require no lubrication or attention. Circle No. 43.

MINE MOTIVE POWER Batteries made with new "AccuPak" plates are described in a new brochure published by C & D Batteries, Inc. According to the company the new plates eliminate any possibility of low cells and extend life of C & D heavy-duty motive power batteries for operation of mine and tunnel haulage equipment. Circle No. 29

NEW AIR POWERED HOIST by Joy Mfg. Co., offers a choice of several throttle and brake systems that make it adaptable for use in mine shafts for hoisting men and materials, car spotting and other useful applications. The hoist has a lifting capacity ranging from 27,000 pounds at 37 fpm to 37,000 pounds at 220 fpm. Circle No. 26.

BORING EQUIPMENT: A new 12-page bulletin describing the KA-MO line of horizontal, vertical, and angular auger type drilling and boring equipment is available from the Kwik-Mix Co., Port Washington, Wisconsin, a division of Koehring Co. The bulletin discussed the wide variety of air, hydraulic, electric, and gasoline powered KA-MO drills available. Circle No. 27.

NEW PILOT DRYER has been developed by Standard Steel Corporation for use in test laboratory. New unit will permit testing of customer's material under controlled conditions of flow, temperature, and flight arrangement. Circle No. 36.

CRANE: New four-page bulletin published by The Thew Shovel Company gives complete details of a new 65-ton crane mounted on heavy truck chassis. Circle No. 37.

ULTRASONIC CLEANER is said to restore used filter elements to "like-new" condition. Developed by Pall Corporation and Cavitron Equipment Corporation, new unit is reported to produce the maximum ultrasonic cleaning intensity that can be created in a liquid. Data is available from Aircraft Porous Media, a subsidiary of Paul Corporation. Circle No. 38.

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY MAIL

FIRST CLASS PERMIT No. 1458, San Francisco, Calif.

MINING WORLD—WORLD MINING
500 HOWARD STREET
SAN FRANCISCO 5,
CALIFORNIA
U. S. A.

List information you want MINING WORLD to obtain for you on this card. WE'LL DO THE REST. NO postage necessary if mailed in U. S.

CYANAMID

REAGENT NEWS

"ore-dressing ideas you can use"

Recent plant tests reveal wider usefulness for new SUPERFLOC 16 Flocculant*

Prove it out-performs previous flocculants for variety of solid-liquid separations

URANIUM

0.003 to 0.10 lb./ton of SUPERFLOC 16 fed to the leach pulp improves settling and filtration rates; assures clearer thickener overflow. SUPERFLOC 16 Flocculant reduces soluble loss in thickened solids or filter cake, prevents sand-slime separation in the thickener, gives higher pulp density in the thickener underflow!

COAL

Less than 1 lb. per hour drip fed as a ½% solution clarifies up to 10,000 gal. per minute of wash water containing 3% solids, increases settling pond capacity, minimizes stream pollution, assures clear effluent or recycle water.

COPPER-MOLY

0.036 lb./ton SUPERFLOC 16 fed to MoS_2 thickener produces a clearer overflow and higher moly recovery than 0.048 lb./ton of other flocculant previously used.

NONMETALLIC MINERAL

Addition of 4 lb. SUPERFLOC 16 per day cuts loss of solids in thickener overflow by 92.2%. Values recovered are worth several hundred times the daily cost of SUPERFLOC used. Comparative tests show SUPERFLOC 16 is substantially better than other flocculants.

WRITE FOR THIS TECHNICAL BULLETIN

Write for technical bulletin giving complete data on SUPERFLOC 16 Flocculant and AEROFLOC® Reagents; working sample and instructions for conducting your own plant test.

*Trademark

CYANAMID DE MEXICO, S.A.
Apartado Postal 988
Mexico 1, D.F., Mexico

CYANAMID OF GREAT BRITAIN LTD.
Bush House, Aldwych,
London W.C. 2, England

SOUTH AFRICAN CYANAMID (PTY.) LTD.
P.O. Box 7552,
Johannesburg, Union of South Africa

E. P. CADWELL
Casilla 4393, Belen 1043,
Of. 7, Lima, Peru

CYANAMID AUSTRALIA PTY. LTD.
Atlas Building, 406 Collins Street
Melbourne, Australia

CYANAMID (FAR EAST) LTD.
506 Nikkatsu International Bldg.
Yuraku-Cho, Tokyo, Japan

CYANAMID OF CANADA LIMITED
Montreal, Quebec
Sales Offices: Toronto, Montreal, Vancouver

Cyanidation Process Chemicals
Flotation Reagents
Flocculating Agents
Film Forming Agents
Surface Active Agents

High Explosives
Permissibles
Seismograph Explosives
Blasting Agents
Blasting Caps
Electric Blasting Caps
Blasting Accessories

AMERICAN CYANAMID COMPANY
EXPLOSIVES AND MINING CHEMICALS DEPARTMENT

CYANAMID INTERNATIONAL — *Mining Chemicals Department*
Cable Address: — Cyanamid, New York

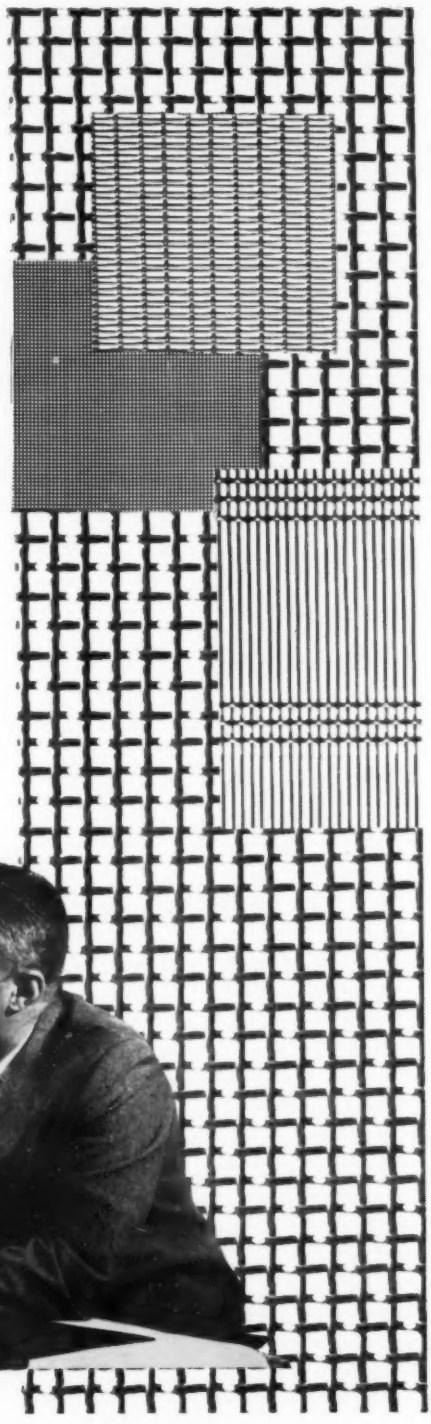
30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

TYLER service offers 53,000 ways to cut screening costs

To meet all the different requirements for sizing, grading, and separating materials, W. S. Tyler has developed wire cloth in innumerable types, sizes, metals, meshes, and designs. Today, over 53,000 different specifications are available.

Matching the *right* wire cloth to your specific needs is the service provided by your Tyler sales engineer. From Tyler's unequalled range of product he has the know-how and experience to give you results.

That's *Tyler Screening Service*—use it to cut your production costs.



WOVEN WIRE SCREENS • SCREENING MACHINERY • TESTING SIEVE EQUIPMENT

TYLER

The W. S. TYLER Company • *Cleveland 14, Ohio*

OFFICES: New York • Chicago • Boston • Philadelphia • Atlanta
Dallas • Los Angeles • San Francisco • Baltimore • Birmingham • Houston • Minneapolis
Pittsburgh • Salt Lake City • The W. S. Tyler Company of Canada, Limited,
St. Catharines, Ontario • OFFICE: Montreal

MEN WHO MAKE NEWS IN U.S.

SHELDON WIMPFEN

ALLEN D. GRAY

DR. A. B. CUMMINS

DR. C. C. LONG

DR. D. L. EVERHART

WM. WRAITH, JR.

Sheldon P. Wimpfen has been appointed executive assistant to **Walter L. Rice**, president of Reynolds Mining Corporation, Richmond, Virginia. Mr. Wimpfen has for the past year been assistant to the president of Western Machinery Company, San Francisco, California, prior to which he was vice president of Glen Alden Corporation for two years.

Allen D. Gray has been elected a director of the Susquehanna Corporation. Mr. Gray is president of Susquehanna-Western, Inc., Denver, Colorado subsidiary of the Susquehanna Corporation, which operates the company's metallurgical and chemical plants.

K. R. Baker has been named division superintendent of St. Joseph Lead Company's Viburnum property at Crawford, Missouri, and **John E. Kiser** is division superintendent at the Indian Creek mines, at Bonne Terre.

Leslie B. Worthington has been elected president of United States Steel Corporation with headquarters in Pittsburgh, Pennsylvania. Mr. Worthington began his career with U. S. Steel in 1923 as a sales apprentice at the South Chicago Works of Carnegie-Illinois Steel Corporation, and most recently has been president of Columbia-Geneva Division, headquartered in San Francisco, California.

Robert Greene, graduate geology student at the University of Tennessee, has accepted a position in the geology department of American Zinc Company of Tennessee, Mascot, Tennessee.

Harry F. Haller is new superintendent of the Church Rock uranium mine of the Phillips Petroleum Company, Gallup, New Mexico. Prior to this, he was employed as superintendent of the Godfrey mine of Snyder Mining Company at Chisholm, Minnesota, and engineer at the Sunday Lake Iron Company mine at Wakefield, Michigan.

M. D. Ayers has been appointed director of engineering for Kennecott Copper Corporation. Mr. Ayers joined the Kennecott organization in 1956 as assistant to the president; before joining Kennecott, he was chief engineer of the Wheeling Steel Corporation, Wheeling, West Virginia.

Donuil M. Hillis has been elected president and director of Four Corners Oil & Minerals Company, Denver, Colorado. He will replace **Edward A. Koester**, who has resigned to re-enter private consulting practice.

Dr. Arthur B. Cummins, manager of central research department of Johns-Manville Corporation, has been elected to serve as president of the Society of Mining Engineers of AIME, to succeed **Jerome W. Woomer. Dr. Carleton C. Long**, director of research at St. Joseph Lead Company, has been elected president of the Metallurgical Society of AIME, and will succeed **Dr. John Chipman.**

Russel B. Caples, vice president of The Anaconda Company, New York, New York, retired at the end of 1959. Mr. Caples, who has been with Anaconda since 1910, was 1957 recipient of the AIME's James Douglas Gold Medal "For distinguished achievements in extractive metallurgy."

Sidney W. Carter has been employed by International Minerals & Chemical Corporation's Florida operations' industrial engineering department as operations research engineer.

William W. Harwood has been appointed chief chemist for the phosphate minerals and chemicals operations of International Minerals and Chemical corporation. Mr. Harwood will supervise the control laboratories at both the Noralyn phosphate plant and Bonnie chemical plants, in Florida.

R. F. Hollis, general manager of Uranium Reduction Company at Moab, Utah has been elected a vice president of that company, and will continue as manager there.

Reuben H. Durst has been appointed chief engineer for general engineering of International Minerals & Chemical Corporation's phosphate minerals and chemicals operations at Bartow, Florida. Mr. Durst was formerly on the central engineering staff of IMC at Skokie, Illinois.

Dr. Augustus B. Kinzel, vice president, research, for Union Carbide Corporation, has been named for the 1960 James Douglas Gold Medal of the AIME. Dr. Kinzel was selected "For outstanding contributions and inspiring leadership in the field of electrolytic and electrothermic winning of nonferrous metals and for his notable administrative ability." Dr. Kinzel was president of AIME in 1958.

Jean Vuillequez, vice president of American Metal Climax, Inc., has been elected as president, chairman of the board of directors, and chairman of the executive committee of the Lead Industries Association.

Dr. Donald L. Everhard is now chief geologist in the Mining and Exploration Department of International Minerals & Chemical Corporation, Skokie, Illinois. Prior to joining IMC, Dr. Everhard was a geologist with the minerals deposit branch of the United States Geological Survey for six years, and chief geologist for the Atomic Energy Commission for 10 years.

William Wraith, Jr., former metallurgical manager of the Anaconda Company, has been elected an assistant vice president of that company. Mr. Wraith, who joined Anaconda in January 1955, will continue to direct and supervise the metallurgical operations of the company and its subsidiaries.

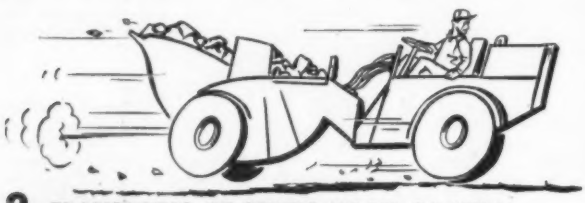
Lawrence A. Roe, director of development in the Research, Engineering and Development Division of International Minerals & Chemical Corporation, Skokie, Illinois, has been appointed staff director, Minerals Processing. In this position he will be responsible for coordinating mineral processing methods within the company and for reporting on new processing techniques in the industry. **Raymond E. Tuttle** will succeed Mr. Roe as director of development.

Recipients of the University of Arizona's 75th Anniversary Medallion of Merit include the following: from Phelps Dodge Corporation, **Walter C. Lawson**, vice president and general manager, **Jack B. Pullen**, assistant general manager, **A. T. Barr**, manager of the New Cornelia branch, **Charles R. Kuzell**, former vice president and new president of Apache Powder Company; from Kennecott Copper Corporation, **A. P. Morris**, Ray Mines Division manager, **Robert W. Thomas**, former Ray Mines Division general manager; from Inspiration Consolidated Copper Company, **Pharic D. I. Honeyman**, president, **H. Carroll Weed**, general manager; from Miami Copper Corporation, **Benjamin R. Coil**, vice president and general manager, **Robert W. Hughes**, former vice president and general manager; **Allan B. Bowman**, vice president and general manager of Banner Mining Company; **John F. Buchanan**, vice president of San Manuel Copper Corporation; **Wesley P. Goss**, president and general manager of Magma Copper Corporation; **Albert Mendelsohn**, former president and general manager of Cananea Consolidated Copper Company; **T. Alfred Snedden**, manager, Southwestern Mining Department of American Smelting and Refining Company; and **Charles F. Willis**, consulting engineer and secretary of Arizona Small Mine Operators Association.

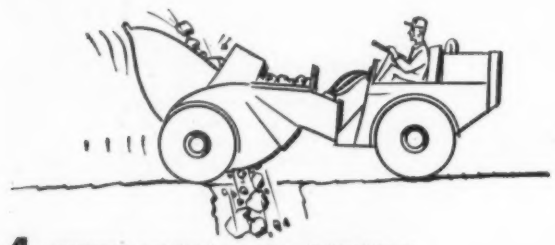
Why TRANSLOADER?

The Only Self-Loading Transport!

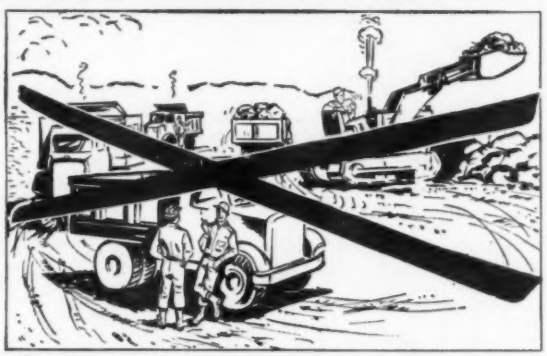
1. LOADS 6 TONS IN 49½ SECONDS!



2. TRANSPORTS AT SPEEDS UP TO 23 MPH — *either direction!*



4. DUMPS LOADS IN 15 SECONDS!



3. NEVER WAITS ON OTHER EQUIPMENT! S-D Transloader saves labor and machine costs wasted in multiple machine operation.

5. NO TURNAROUNDS REQUIRED! Returns immediately to reload! Travels at higher speeds than other equipment because of low center of gravity and articulated steering!

THIS IS WHY the S-D Transloader is more efficient than conventional equipment and methods of materials handling. But this is not all. The S-D Transloader way is the **lowest possible cost way** because:

1. **LOWEST ORIGINAL COST** for tons handled!
2. **LOWEST MAINTENANCE** due to extremely simple design and high quality of components . . . such as T-1 Steel, Cummings Engines, Clark Axles, Allison Transmissions!
3. **LEAST VENTILATION** required underground due to low horsepower ratio to work-done!
4. **LOWEST LABOR COST PER TON!** Incentive systems fit the S-D Transloader like a glove because of solo operation! Nothing could be neater than an operator loading and running a known distance to discharge **by himself!** This RELEASES SUPERVISION! S-D Transloader also ELIMINATES TASK OF TRYING TO BALANCE MEN AND EQUIPMENT WITH CONSTANTLY CHANGING SITUATIONS!

Write us today for Complete Packet of illustrated literature, data and time studies on this remarkable machine —

THE ONLY SELF-LOADING TRANSPORT! Sanford-Day Iron Works, Inc., Dale Avenue, Knoxville, Tennessee. Telephone: 3-4191

SANFORD-DAY

KNOXVILLE, TENNESSEE

Famous Traylor Gyratory Crushers are manufactured in sizes designed to solve most reducing problems. From the mighty 60" TC to the TF Fine Reduction Crusher—Traylor engineers supply the finest Gyratory obtainable.

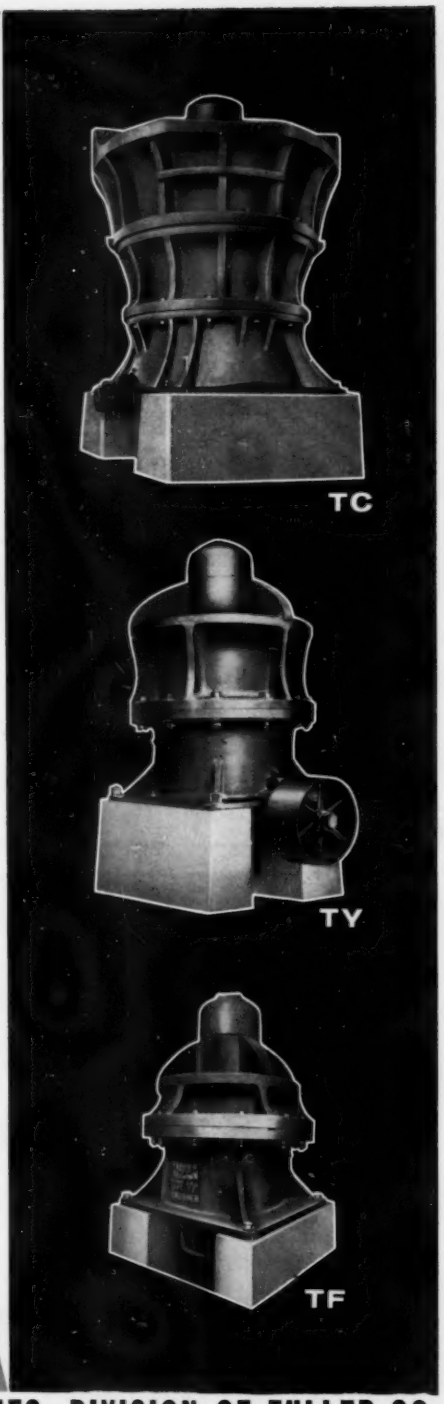
Traylor-made gyratory crushers

TC Gyratory Crushers are made in 7 sizes with feed openings 20" to 60" and capacities from 1,240 to over 32,000 tons per eight-hour day. For additional information, write for Traylor Bulletin No. 1126.

TY Reduction Crushers are built in 6 sizes from 1'—3" to 5'—6" and with feed openings from 3" to 22". For more information, write for Bulletin No. 8112.

Traylor TF Fine Reduction Crusher produces 5/8" to 1 1/4" material in large capacities. Over a half century of engineering experience is built into all Traylor crushing machinery. Write for Bulletin No. 127.

Visit us at Booth No. 56 at the CRUSHED STONE SHOW— Feb. 22 thru 24 Conrad Hilton, Chicago



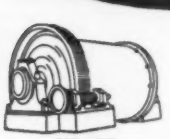
Traylor

ENGINEERING & MFG. DIVISION OF FULLER CO.

1512 MILL ST., ALLENTOWN, PA.

Sales Offices: New York — Chicago — San Francisco
Canadian Mfr.: Canadian Vickers, Ltd., Montreal, P.Q.

FULLER COMPANY GENERAL AMERICAN TRADE MARK


BALL MILLS

ROTARY KILNS

APRON FEEDERS

PRIMARY GYRATORY CRUSHERS

JAW CRUSHERS

SECONDARY GYRATORY CRUSHERS

MAGMA

COPPER COMPANY

Buyers of

COPPER, GOLD

AND SILVER ORES

MINES AND SMELTER AT

SUPERIOR, ARIZONA

PURCHASERS OF

LEAD AND ZINC

CONCENTRATES

THE BUNKER HILL COMPANY

Producers of Top Quality Products

LEAD • ZINC • CADMIUM • SILVER • LEAD AND LEAD ALLOY PRODUCTS • CHEMICAL PRODUCTS

WIRE PHONE WRITE | ORE PURCHASING DEPT. • THE BUNKER HILL COMPANY

Telephone: Kellogg 2261 • P. O. Box 29, Kellogg, Idaho

Metal & Mineral Prices

U.S.A.

METALS

January 22, 1960

COPPER: **Electrolytic.** Delivered F.o.b. cars, Valley basis (pound) ..... 33.00¢
Lake. Delivered, destinations, USA ..... 33.00¢
Foreign. Delivered, destinations, USA ..... 33.00¢
Custom ..... 35.00¢
LEAD: **Common Grade.** New York (Per pound) ..... 12.00¢
Tri-State Concentrate, 80% lead, per ton $141.72
ZINC: **Prime Western:** F.o.b. E. St. Louis (Per Pound) ..... 13.00¢
Prime Western: Delivered New York ..... 13.50¢
Tri-State Concentrate, 60% zinc per ton $80.00
ALUMINUM: **Primary 30 Pound Ingots (99.5% plus)** (Per pound) 26.80¢
ANTIMONY: **Lone Star Brand. F.o.b. Laredo, in bulk (Per pound)** 29.50¢
BISMUTH: (In ton lots) price per pound $2.25
CADMIUM: **Sticks and bars.** 1 to 5 ton lots Price per pound .. $1.50
COBALT: **97.99%,** keg of 550 pounds (Price per pound) $1.75
COLUMBIUM: **Powder** ..... Nom., per pound $55.00-$85.00
GERMANIUM: dioxide, high purity, gram ..... 18.50¢
LITHIUM: **98%** (per pound) ..... $9.00-$12.00
MAGNESIUM: **Ingots (99.8%)** F.o.b. Velasco, Texas per pound 36.00¢
MERCURY: **Flasks.** Small lots, New York ..... $211.00-$213.00
NICKEL: **"F" Ingots (5 pounds).** F.o.b. Port Colbourne, Ontario 75.50¢
PLUTONIUM: To July 1 1962 AEC will pay $30.00 to $40.00 per gram depending on plutonium 240 content. July 1, 1962 to June 30, 1963, per gram $30.00
SELENIUM: **99.5%, per pound** $7.00
TELLURIUM: Common grade, Per pound $3.00
THORIUM: per kilogram $43.00
TIN: **Grade A Brands.** New York (Per Pound) Prompt delivery $1.00
TITANIUM: **93.3%** + Grade A-1 Sponge (Per pound) ... $1.50-$1.60
URANIUM: **Rod (0.790 U-235) $16.00 Per Pound; Foil** $16.75
U-235: **Nominal** (Per pound) $7,725
GOLD: **United States Treasury Price** ..... $35.00 per ounce
SILVER: **Newly mined domestic.** U.S. Treasury price per ounce 90.5¢
Foreign Handy Harmon ..... 91⅜¢
PLATINUM: Per ounce ..... $77.00-$85.00
ZIRCONIUM: **Sponge,** Per pound, Reactor Grade $5.00

ORES AND CONCENTRATES

BERYLLIUM ORE: **10 to 12% BeO.** F.o.b. mine, Colorado $46.00 per unit
Small lot purchases at Custer, S. D., Spruce Pine, N. C.,and Franklin, N. H. Visual inspection at $400.00 per short ton or by assaying at 8.0 to 8.9% BeO, $40 per unit; 9.0 to 9.9%, $45; over 10.0%, $48.00.
CHROME ORE: F.o.b. railroad cars eastern seaports. Dry long tons.
African (Rhodesian). 48% CR_2O_3. 3 to 1 Ratio .... $35.00-$36.00
African (Transvaal). 48% Cr_2O_3. No ratio ..... $28.00-$32.00
Turkish, 48% CR_2O_3. 3 to 1 chrome-iron ratio ... Nominal $45.00
U.S. Government ore-purchase depot Grants Pass Oregon. Buying suspended, quota filled.
COLUMBIUM-TANTALUM ORE: Per Pound Pentoxide Nominal $1.00
IRON ORE: **Lake Superior. Per gross ton Lower Lake Ports**
Mesabi, Non Bessemer, 51.5% Fe $11.45
Mesabi, Bessemer, 51.5% Fe $11.60
Old Range Non Bessemer $11.70
Old Range Bessemer $11.85
Swedish, Atlantic Ports, 60 to 68% Fe Contracts, Per Unit 25.00¢
MANGANESE ORE: **Metallurgical grade.** 48 to 50% Mn Long ton unit ..... $0.95-$1.00
Metallurgical grade. 46 to 48% Mn. Long ton unit ... $0.90-$0.95
Metallurgical grade. 44 to 46% Mn. Long ton unit ... $0.80-$0.85
Domestic U.S. Government. GSA Basis $2.30 per unit for 48% mn.
MOLYBDENITE CONCENTRATE: **90% MoS_2 F.o.b.** Climax, Colorado. Per pound Mo, plus container cost $1.25
TUNGSTEN CONCENTRATE: **Domestic. 60% WO_3 Per short ton unit** ..... Nominal $24.00
Foreign: 65% WO_3 Per short ton unit (Scheelite) ... Nominal $18.00
Foreign: South American, Spanish, Portuguese ..... Nominal $17.00
URANIUM ORE. F.o.b. purchase depot or company mill in accordance with AEC schedules and company buying contracts. Basic price is $1 50 per pound of U_3O_8 in ore assaying 0.10 percent. For each additional 0.01 add 20¢. Subject to development allowance, premiums, penalties where applicable.

NON-METALLIC MINERALS

BARITE: Oil well drilling. Minimum **4.25 specific gravity,** per short ton $16.00
BENTONITE: **Minus-200mesh.** F.o.b. Wyoming. Per ton, carload lots $12.50
Oil Well grade. Packed in 100 pound paper bags $14.00
BORON: technical grade .. F.o.b. Boron California. Per ton $47.50
FLUORSPAR: **Metallurgical grade.** 72.5 % effective CaF_2 content per short ton F.o.b. Illinois-Kentucky mines ... $37.00-$41.00
Mexican. 70% F.o.b. border ..... $26.00-$27.00
Acid Grade. 97% CaF_2, Bulk, F.o.b. mine ..... $45.00-$49.00
PERLITE· **Crude:** F.o.b. mine per short ton ..... $3.00 to $5.00
Plaster grades. Crushed and sized. F.o.b. plants .... $7.00 to $9.00
SULPHUR: Long ton, F.o.b. Hoskins Mound, Texas $25.00
Export ..... $24.00-$25.00

London

January 22, 1960

Per Long Ton USA Equivalent cents per pound*

COPPER:	**Electrolytic spot**	£260	15s 0d	32.59¢
LEAD:	**Refined, 99%**	£ 74	5s 0d	9.28¢
ZINC:	**Virgin, 98%**	£ 93	12s 6d	11.70¢
ALUMINUM:	**Ingot, 99.5%**	£186	0s 0d	23.25¢
ANTIMONY:	**Regulus, 99.6%**	£197	10s 0d	24.69¢
TIN:	**Standard, 99.75%** ..	£792	10s 0d	99.06¢
TUNGSTEN:	**Long ton unit**	£175s		$21.98

***With Sterling Pound at $ 2.80**

Quotations on metals and certain ores through the courtesy of *American Metal Market, New York, N. Y.*

WHAT'S GOING ON IN MINING

Geological Survey, Bureau Of Mines Give Fiscal Reports

Accomplishments of the U. S. Bureau of Mines and of the United States Geological Survey are reviewed in two annual reports for the 1959 fiscal year, the Department of Interior has announced.

Highlights of the mineral agency's report include details about pioneering metallurgy that created shaped molybdenum castings to speed space exploration and missile development. Studies of blasting techniques and rock breakage, and research on ways of utilizing submarginal phosphate deposits are also contained in the report.

The Geological Survey review discusses cooperative programs totalling $4,000,000 in effect in 34 states, Puerto Rico, and the Virgin Islands; investigation of geological and mineral resources carried on through more than 400 active projects; airborne radioactivity and magnetic surveys that provided new geophysical data; mineral classification results, and related subjects.

CENTRAL STATES

The **Reynolds Mining Corporation** has purchased bauxite producing property in Pulaski County, near Little Rock, Arkansas, from the **Dulin Bauxite Company, Inc.**, headed by P. A. Dulin. The $1,210,000 transaction includes six tracts of land and underground mining equipment. Sale of the property, which has been recorded in the Pulaski County Circuit Clerk's office, represents all the bauxite land owned outright by Dulin and also the Dulin leases held by Reynolds in Pulaski and Saline counties. Terms were a cash payment of $302,500, with a balance of $907,500 to be paid in 15 annual installments of $60,500 each.

Athletic Mining & Smelting Company on January 1 completely shut down its zinc smelter at Fort Smith, Arkansas. Resumption of work, according to Raymond F. Orr, president of the firm, is dependent on getting zinc concentrate, which in turn will depend on government action with respect to present restriction on imports. The operation had been running at reduced capacity since June 1957 and last fall was at only 40 percent capacity because the government quota system had limited concentrate imports from Mexico.

Shaft sinking at the $30,000,000 **Pea Ridge** iron mine near Sullivan, Missouri, was resumed in mid-December after a strike of nearly eight months by the 60-man United Steel Workers Local 5790. Shaft No. 1 at the mine is down 1,680 feet. Shaft No. 2 had been allowed to fill with water during the strike but work on pumping it dry began immediately. Officials of **Meramec Mining Company** which operate the project, expected to start construction on its extensive building soon. Meramec is jointly owned by **Bethlehem Steel Corporation** and **St. Joseph Lead Company**.

EASTERN STATES

Tennessee Copper Company of Copperhill, Tennessee, reports rapid progress during the last six months on the new shaft and surface units at its Cherokee mine. Sinking in rock began in mid-December from a point 70 feet below surface. Three hoists are used in the shaft-sinking operation; one to handle the drill jumbo and work cage; a second for raising and lowering the mucking skip; and a third to handle the new Cryderman shaft mucker. When Cherokee becomes an ore producer in about five years, its ore will be hauled through a drift started from Central Shaft's 10th level to the **School Property** two years ago and subsequently hoisted to surface. Cherokee shaft will be used only as an entrance for miners, for transport of materials, and as part of the mine ventilation system.

Four safety awards to phosphate mines operated by **American Cyanamid** in Polk and Hillsborough counties in Florida were presented recently by the **U. S. Bureau of Mines**. Recognition of accident-free record performances went to **Orange Park** mine near Lakeland, Florida, and to **Sydney** mine in eastern Hillsborough County. **Sydney** operated more than 5½ years, from April 12, 1954, to October 30, 1959—about 1,935,000 man-hours—without a disabling injury. **Orange Park** mine's safety record dates from June 24, 1957. **American Cyanamid's** Brewster, Florida, plant, which includes both mines, holds the world's record for open-pit mining without a lost-time accident. The period covered is from June 24, 1957 to October 30, 1959, with 3,820,000 man-hours, or nearly 2,000,000 man hours better than the previous record. Awards were presented to the labor-management safety committee at each of the mines.

A compromise settlement has been reached in the suit brought against **Lithium Corporation of America,** Minneapolis, Minnesota, by **Quebec Lithium Corporation** resulting from termination of a long-term contract by Lithium Corporation for purchase of lithium ore from the Quebec firm. Under the settlement Lithium Corporation will pay Quebec Lithium $1,900,000, but about 55 percent of this will be paid out of tax credits so the total cost to the United States company will be less than $800,000. Recently Lithium Corporation has started processing ore again from its own North Carolina mines.

Geologists from **New Jersey Zinc Company's** Jefferson City, Tennessee, office have examined the **Wilkins Creek** pyrrhotite prospect in Haywood County, North Carolina. Although the prospect has been examined superficially by many southeastern mining companies before, no detailed, modern prospecting techniques have been applied to determine the extent of the magnetic sulfide deposits. The pyrrhotite in the Wilkins Creek prospect contains small amounts of silver, nickel, and cobalt.

The new **U. S. Bureau of Mines Minerals Yearbook,** one of the largest ever issued, is now available. A comprehensive three-volume record of activities and de-

American Zinc Reopens Grasselli Mine

The American Zinc Company of Tennessee reopened its Grasselli zinc mine at New Market, Tennessee in January. The mine was closed down in December 1957 when the price for zinc metal fell to 10.0 cents per pound. It is estimated that the mine will produce about 750 tons of ore per day. In part, this production will offset the decline in output from American Zinc's North Friend's Station mine which is on a final cleanup basis. Some men and equipment have been transferred from North Friends to Grasselli. The picture shows the No. 1 shaft which is used for men and equipment. Air compressors and the man hoist are located in the building at left. Harry Miller, superintendent of Jefferson County mines, is in charge of the Grasselli. Tennessee is now the leading zinc producing state with 1959 output being estimated at 87,079 tons up from 59,130 in 1958. Three companies are now mining and milling about 11,000 tons of ore daily. Increased production is ahead, too.

When you need competent hands to deliver a core . . . to mine some ore . . . or a tunnel to bore . . . choose Boyles Bros.

65 years of dependable drilling for the mining and construction industries

- **CORE DRILLING**
- **EXPLORATION and DEVELOPMENT**
- **SHAFT SINKING**
- **ROCK BREAKING**
- **GROUTING**
- **MINING and QUARRYING**
- **TUNNEL DRIVING**
- **MINE PLANT DESIGN and FABRICATION**

Chicago Pneumatic

DIAMOND DRILLS AND EQUIPMENT

Write for full details

Boyles Bros. DRILLING COMPANY

GENERAL OFFICES.
Salt Lake City, Utah.. . . .HUnter 7-7595
BRANCHES:
Phoenix, Arizona . . CRestwood 4-5331
Sacramento, California . IVanhoe 3-5221
Denver, Colorado. . . . . ALpine 5-9244
Boise, Idaho. 3-7152
St. Louis, Missouri. . . . . PLateau 2-2544
Reno, Nevada . . . . . FAirview 9-0732
Spokane, Washington . . . WAlnut 4-2614
Alaska . . . . Contact Salt Lake City Office

velopments in the nation's mineral industries during 1958, this 2,779-page edition is the first since 1941 to be completed in the year immediately following that covered. Copies can be obtained only from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at these prices: Volume I-Metals and Minerals, Except Fuels, $4.00; Volume II-Fuels, $2.25; Volume III-Area Reports, $3.75.

The D. C. Jackling Fund Committee of the **Mining and Metallurgical Society of America** has announced that a post-doctoral fellowship, with a maximum grant of $5,000, will be made for the academic year 1960-1961. The first award will be made available this year to a postgraduate Ph.D., who is to undertake or is working on a worthwhile research problem connected with mining and general sciences, which may include geology, geophysical, and geochemical exploration. Candidates should submit an outline of proposed research, dealing with one of the above subjects, to be carried on at any institution agreed upon by the Jackling Fund Committee. The candidate should be sponsored by the chairman of a department of an institution where post-doctoral investigation can be carried on. If the first year's work of the Fellow is satisfactory and the project warrants, the initial award may be renewed. Applications should reach the committee by April 15, addressed to D. C. Jackling Fund Committee, Mining and Metallurgical Society of America, 11 Broadway, New York 4, New York.

International Minerals & Chemical Corporation has ceased operations for recovery of uranium phosphate at its Bonnie chemical plant near Bartow, Florida. The uranium section was closed because the five-year **Atomic Energy Commission** contract had expired. Discovery of richer deposits has made production by this process non-competitive.

A complete fertilizer pilot plant is being operated by the **American Cyanamid Company's** development department at Brewster, Florida. Located in the triple superphosphate plant area, it will be used for process and product improvement, process development, and customer service whenever special problems are presented. The plant will be able to duplicate the operations in a customer's plant, so that it can advise the customer on how best to use American Cyanamid products.

IRON RANGES

With completion of the current expansion program at the Humboldt, Michigan, mine of **Humboldt Mining Company**, the plant will have a yearly capacity of 650,000 tons of pellets of approximately 62 percent iron content. The project, scheduled to be completed in mid year, includes enlarging the flotation mill and crushing plant, and construction of a new pelletizing plant. At the latter plant, the company will install two **Allis-Chalmers** parallel lines of Grate-Kilns for heat treatment of hematite flotation concentrates. Following flotation to more than 60 percent total iron content, the hematite concentrates will be balled in two drums 9 feet in diameter by 30 feet long. Pellets will then be screened to permit only those of proper size to enter the grate section. The traveling chain-type grate will be 9 feet, 4 inches, wide on 71-foot centers, enclosed by refractory bricks and housing. Fired pellets will discharge from the grate directly into a relatively short rotary kiln where firing is completed before pellets are cooled in a 25-foot-diameter annular cooler designed for efficient heat recovery from the hot pellet product.

The **Pacific Isle Mining Company** is stripping at the **Iroquois** and **Wyoming** mines on the Mesabi Iron Range. The firm plans to add a heavy media unit at the Julia washing plant at Virginia, Minnesota, and is repairing its mining equipment and beneficiation plants. In Florence County, Wisconsin, mining will be concluded this year, with only nominal production from stockpile scheduled.

Iron ore shipments from United States Lake Superior ports in 1959 were lower than at any time since World War II, totalling 42,651,729 gross tons, as compared with 50,663,091 tons in a shorter season in 1958. However, during December, following the end of the steel strike, shipments totalled a record 3,110,281 tons—more than doubling the previous record of 1,550,990, set in 1956. A new high for shipments was hit during the 1959 season by **Erie Mining Company**, which shipped 3,561,376 tons out of Taconite Harbor, nearly 1,000,000 more than in 1958. **Reserve Mining Company** had shipments out of Silver Bay totalling 3,640,008 tons, compared with 4,994,174 tons in the 1958 season. Predictions call for record steel output in 1960, so all signs point to record activity on the Iron Ranges, with resumption of shipments planned as soon as lakes thaw. Estimates indicate Youngstown, Ohio, steel firms will have enough ore for full blast furnace operations through the winter, unless the Great Lakes navigation season opens unusually late. However, **United States Steel Corporation** plans to move by rail during the winter over 400,000 tons of Venezuelan ore to Youngstown. **Republic** and **Youngstown** are moving Laborador ore by rail from Eastern docks to steel mills in Ohio. **Wheeling Steel Corporation** will use barges to move its 300,000-ton stockpile of iron ore part of the way from Benwood, West Virginia to Ohio.

Oliver Iron Mining Division of **United States Steel Corporation** has purchased over 2,000 acres of tax forfeited land near Mountain Iron, Minnesota. The land will be used as a possible site for a commercial taconite plant to supplement facilities currently in operation at the company's Pilotac plant near Mountain Iron. No official committment has been made for construction of the commercial plant. Ttotal cost of the acquisition was $63,148.

Sixth annual meeting of **The Lake Superior Institute of Geology** will be April 14 and 15 at the Wisconsin Center on the campus of the **University of Wisconsin** in Madison. Joint sponsors are the university's department of geology and the Wisconsin geological and natural history survey. Emphasis of the Institute has been on Pre-Cambrian geology, but papers on other subjects are welcome. Papers should be planned for 15 to 20 minutes duration.

Fifth Annual Alaskan Mining Conference Set for April

New techniques in placer mining will be one of the subjects under discussion in College, Alaska, April 11 to 14, at the fifth annual Mining, Minerals and Petroleum Conference of the American Institute of Mining, Metallurgical and Petroleum Engineers.

Among speakers at the four-day session will be Dr. Joseph L. Gilson, 1960 president of AIME and chief geologist for DuPont Company of Wilmington, Delaware, and Dr. James Boyd, vice president, exploration, Kennecott Copper Corporation, New York. The conference will be pinpointed toward exploration and feature leaders in their fields.

Meetings will be held in the lecture hall, Bunnell Memorial Building, University of Alaska. Members of the conference steering committee include James Crawford of United States Smelting Refining and Mining Company, and Bruce Thomas of the U. S. Bureau of Mines.

The conference is sponsored by the Alaska and Southwest Alaska sections of AIME and by the University of Alaska.

Discovery of molybdenum near Hayes Glacier west of Anchorage, Alaska, has caused interest recently. Although the true value of the deposit will not be known until after further investigation and exploration, it is reported as promising and a large number of claims have been staked.

Fred Parker and Jack Raymond mined placer gold at Candle Creek on the Seward Peninsula, Alaska, during the summer of 1959. The Havenstrite Company formerly mined on this creek.

Walt Roman plans to move his placer operation, which is near the Miller House in the Circle District, Alaska, to upper Portage Creek where he has leased ground formerly mined by old timer Hank Martin.

Carl Parker has placered gold on Eva Creek on ground leased from the **United States Smelting Refining and Mining Company.** The ground was stripped by the company, but not dredged because of the steep grade.

The **Liberal King** mine in Shoshone County, Idaho's Pine Creek zinc-lead district, idle for the last two years, has been acquired by **Spokane National Mines, Inc.,** from **Sunset Mines, Inc.** The agreement provides for issuance of 500,000 shares of Spokane National to holders of 2,500,000 shares of Sunset stock outstanding. The new management plans a geological investigation of the property to determine if exploration is warranted to try to uncover additional ore deposits. A 150-ton selective flotation mill at the Idaho mine will be moved to Spokane National's recently acquired **New Departure** silver mine near Bannack, Montana, under present plans. George Allison, Spokane, is president of the Spokane firm. O. Bardahl, Seattle heads **Sunset Mines.**

The **Conjecture** mine shaft in Idaho's Lakeview mining district will be deepened 400 feet in 1960 to provide for a new 1,400-foot operating level. Miners are raising on the main ore shoot after driving the 1,000-foot level to a total distance of 1,600 feet from the new vertical shaft. Work is on a curtailed winter basis of two shifts six days weekly. The property is owned by **Conjecture Mines, Inc.,** and operated by **Federal Uranium Corporation.** R. W. Neyman of Salt Lake City is president of Federal Uranium.

With all construction and work on new facilities completed in January, the new flotation mill is scheduled to be in operation this month at the **Lucky Friday Silver-Lead Mines Company** in the Coueur d'Alene mining region of Shoshone County, Idaho. The company, in which **Hecla Mining Company** of Wallace, Idaho, owns a 38 percent stock interest, milled 63,422 tons of ore in the 11-month period ended November 30, 1959, assaying 16.2 ounces of silver per ton, 9.4 percent lead, and 1.3 percent zinc. In addition, about 5,600 tons of crude ore were stockpiled. All concentrates produced since August 15, 1959, were stockpiled, but shipments to smelter were resumed in mid-December. The company discontinued work at the **Silver Mountain** property, east of Mullan, Idaho, November 7, because no signs of mineralization were found to warrant further activity. Last work involved diamond drill hole exploration below the old **Snowstorm** workings. Pipe, track and underground equipment are being removed.

Day Mines Company has announced that exploration on the 1,100-level of its **Dayrock** mine north of Wallace, Idaho, has found a previously undiscovered vein of silver-lead ore. When 25 feet of the vein were opened, there were indications of commercial silver-lead ore of a fair width and with a higher than average silver-lead ratio. Known as the Hornet vein, the find lies north of the Bonanza vein, Dayrock's main producer in recent years.

Hall Mountain Thorite Mining Company plans to explore for the extension of a zone of high-grade thorite opened recently on the adjoining property of **Northwest Prospecting and Development**

Readers Report This Is a Jackson Rock Drill

The rock drill pictured above was found as shown in an old tunnel at property now being developed by Monarca Mines Inc. in the Silver City district of Owyhee County, Idaho. MINING WORLD asked its readers in the December 1959 issue if they could identify this rock drill. Here are their identifications: Charles V. Troutman of Tucson, Arizona writes, "The drill bears marked resemblance to advertisement illustrations of the Jackson Hand-Powered Rock Drill which was advertised immedately before and after 1900 in the *Mining Reporter* by the Jackson Drill and Manufacturing Company of Denver, Colorado." G. L. Grover, a 90-year-old mine blacksmith now living in Healdsburg, California, says that, "It looks like a Jackson hand-powered rock drill which used a three-quarter chisel bit. It looks like one I helped set up many years ago. If you want to learn rock drilling the hard way quickly, try to get hold of a Jackson drill and I think one time would be enough with that toy". From Colorado Springs, Colorado, H. H. Burt writes that, "It is the Wright rock drill which was manufactured in Denver, Colorado, and a number were sold. Even the City of Colorado Springs bought several for use by the Water Department. Mr. Wright used the drill in driving a tunnel on his prospect in the mountains near Colorado Springs. He was able to drill a round of nine holes 18 inches deep in a day's time with his drill."

Company near Porthill, Boundary County, Idaho. Only assessment work was done this past season. Bruce R. Berringer of Spokane is president.

More than 660,000 tons of phosphate rock were mined in Idaho's Georgetown Canyon in 1959 for the new Georgetown fertilizer plant of **Central Farmers' Cooperative.** Wells Cargo did the mining, with Robert Sacrison as superintendent.

An unknown silver vein found recently at a depth of 3,000 feet in the **Galena** mine, Shoshone County, Idaho, had been followed for more than 125 feet at last report, with very encouraging results. Although narrow, the vein contains high values and is commercial. Most production from the mine, which now ranks as the second largest silver producer in the Coeur d'Alene mining region, is from a silver-bearing vein southeast of the new discovery. The mine is owned by **Callahan Mining Company** and operated by **American Smelting and Refining Company.**

Harold and Ernest Oberbillig have opened up some mercury ore in their **Vermillion** and **White Metal** claims near Stibnite, Idaho, and plan to start their mill next spring. Henry Estill and sons of Emmett have moved a 50-ton mill from the **Sherman-Howe** mine near Burgdorf, Idaho to Pearl and have set the machinery in a new building. They plan to mill silver ore from the **Lucky Ridge** property at **Pearl.**

Progress in an easterly exploration tunnel from **Page** mine workings in Shoshone County, Idaho, has been slowed by a large fault structure. A sand fill project is underway on the 1,200 level of the mine. The mine is owned and operated by **American Smelting and Refining Company.** J. C. Kieffer of Wallace is manager of Northwestern mining operations.

Mining and milling gypsum for **Rock Island Gypsum Company** north of Weiser, Washington County, Idaho, has been taken over by **Marcum Trucking, Inc.** of Boise, N. C. Jones of Halfway, Oregon, who had the contract, was killed in an airplane crash.

Prospectors and Miners, Inc. has been organized as a non-profit organization to promote the mining industry. Incorporators were Elmer Lyons, Margaret L. Hart and James W. Hart of Grangeville, Idaho, and George A. Denison, Herman E. Dobroth and Leonard C. Deye of Lewiston, Idaho.

Montana continued to produce iron during the steel strike. **Young-Montana Corporation,** with its leased **Willow Creek** mine in the Running Wolf district south of Stanford, was the largest producer. Most iron ore was sent to the ore loading docks of the **Great Northern Railroad Company** in Duluth, Minnesota, for shipment by boat to Buffalo, New York, for treatment.

Spokane National Mines, Inc., is planning to move a 150-ton selective flotation mill from near Kellogg, Idaho, to the **New Departure** silver mine near Bannack, Blue Wing district, Beaverhead County, Montana, this spring. George Allison of Spokane, is company president.

Small-scale mining and milling operations and investigation of possible open-pit mining operations are planned for 1960 by **Golden Anchor Mining and Milling Company,** Elliston, Powell County, Montana. Work in 1959 consisted principally of surveying, with a small amount of gold-silver-lead-zinc ore mined and stockpiled. Henry L. Newmiller of Elliston and Spokane, Washington, is president.

Reconstruction of the old Bannack cyanide mill in the Bannack gold district near Dillon, Montana has been completed by **Spokane National Mines, Inc.,** and testing is being done as weather conditions permit. The Spokane firm has added the **Junction** claim to its other recently acquired holdings in the Bannack camp. The claim was acquired from **Security Mining Company** of Worland, Wyoming.

A vein of high-grade lead ore has been uncovered in bulldozing operations at the **Bay Chief** property in the Eddy Creek district, Sanders County, Montana. The property is owned by **State Mining Company** of Spokane, Washington, which was organized by the late Fred M. Viles.

The old **Meadow Mountain** Tunnel near Saltese, Mineral County, Montana, has been reopened by **Mineral King Mining Company** and an exploration program is planned.

A research center primarily concerned with physical metallurgy of the refractive metals, especially problems in fabrication, will be established by **Wah Chang Corporation** in connection with its Albany, Oregon, plant. Basic properties of zirconium, hafnium, columbium, tantalum, and molybdenum will be studied. The company has installed a second electron-beam melting furnace to meet increased needs for high-purity columbium and tantalum alloys, and a rolling mill for producing rods and sheets from refractory metals. Because new types of products will be manufactured with the new facilities, the research department is a necessary adjunct.

The 13th annual **1960 Pacific Northwest Metals and Minerals Conference** of the **American Institute of Mining, Metallurgical and Petroleum Engineers** will be held in Portland, Oregon April 28, 29, and 30. Sessions of the **American Society of Metals** will also be held at that time. Hollis M. Dole, director of the **Oregon Department of Geology and Mineral Industries,** is general chairman. John R. Anderson, product engineer of the **Carborundum Company,** is co-chairman.

Opening up of what appears to be a chimney of lead-zinc-silver ore is planned for this spring by **Uranium Lead Zinc Mines, Inc.,** at the former **Columbia Lead and Zinc Mining Company** property near Z Canyon, Metaline mining district, Pend Oreille County. The chimney was uncovered this past season by bulldozer work. Reinhold Renner, of Spokane, is president.

Truck shipments of uranium ore from the former property of **Northwest Uranium Mines** in the Spokane Indian Reservation, Stevens County, Washington, currently are running 3,500 to 4,000 tons monthly. **Silver Buckle Mining Company,** which took over the operation several years ago, is the only custom ore shipper at present to **Dawn Mining Company's** uranium processing plant at Ford. Dr. F. E. Scott of Wallace, Idaho, is president of Silver Buckle.

Lovitt Mining Company has resumed direct smelter shipments of gold ore interrupted by a four-month labor strike at the Tacoma, Washington, smelter. During the strike, a 25-man crew concentrated on development work at the firm's **Gold King** mine near Wenatchee, Chelan County. In a normal year, the company ships 60,000 to 70,000 tons of ore to the Tacoma smelter. E. H. Lovitt, Wenatchee, is president.

Annual assessment work done by **Painted Desert Uranium and Oil Company** included blasting and trenching of uranium claims at Orient, Stevens County, and diamond drilling in the Mount Spokane uranium district, Spokane County, Washington. W. M. Fredericks, Spokane, is secretary-treasurer.

The Josephine ore horizon, current producing zone in Pend Oreille County, Washington's Metaline district, has a potential of about 400,000,000 tons of lead-zinc ore, according to latest estimates of mining operators who oppose proposed construction of power dams on the Pend Oreille River for fear reservoir water would flood the mines. The tonnage is estimated to contain more than 5,000,000 tons of lead and over 6,500,000 tons of zinc, worth about $2,875,000,000 at current prices. Production to date has been more than 9,250,000 tons valued at $61,000,000.

A crew of 40 men worked on the **Glacier Peak Mining and Smelting Company** property last summer for **Bear Creek Mining Company.** The firm has been working summers on the property since 1953, and has made regular option payments. The **E. J. Longyear Company** conducted four months of diamond drilling under contract for Bear Creek, while the firm itself did geological, geophysical, and geochemical work, and located a few more claims.

Canon City Uranium Plant Will Quadruple Capacity

Capacity of the Canon City, Colorado, pilot plant of the Cotter Corporation will be quadrupled as a result of a new uranium purchase contract with the Atomic Energy Commission. The expansion, which is to start immediately, will make the facility a full-scale uranium processing mill and increase its capacity from about 50 tons to approximately 200 tons per day.

Cotter Corporation has operated since mid-1958 on its present contract, processing uranium-bearing ores of the Colorado Front Range area. The new contract extends through February, 1965.

Main offices of Cotter is at Santa Fe, New Mexico. The Canon City offices are headed by David P. Marcott, vice-president and general manager.

The new contract, part of the Commission's policy for expansion of domestic uranium procurement, provides a market for a number of producers whose properties hereafter are "dedicated" to the Canon City mill. Other properties may be added at the Commission's option.

Operating assets of **Humphrey Gold Corporation**, including heavy mineral and concentrating plants near Jacksonville, Florida, were sold recently to **Humphreys Engineering Company** of Denver, Colorado. Both firms are subsidiaries of the **Humphreys Investment Company**. The engineering concern also manufactures and sells Humphreys spiral concentrators used in the beneficiation of ores.

Standard Uranium Corporation has moved its San Juan County, Colorado, offices from the Shenandoah mill to new quarters in the former **Southern Power Company** sub-station building recently purchased by Standard. The company reports that engineers had inspected the breast of the old Gold King tunnel which is being enlarged. According to Russell Wood, assistant general manager, a dry tunnel would be encountered within the next 300 feet. The enlarged tunnel is now in about 4,000 feet. The Gold King tunnel was originally driven in over 6,000 feet and will be extended an additional 4,000 feet.

Safety records have been set by two crews of Climax Molybdenum Company at the Climax, mine, in recent weeks. The Phillipson Level supply and Maintenance crew, under supervision of John Ostrom, led all other plant crews with a two-year record of no accidents, dating from the last accidental injury on November 2, 1957. Workmen on the Phillipson level set and repeated records for that level by working 140,000 man-hours without a disabling injury. This was the longest injury-free period for that level in the last five years, according to P. M. Wadsworth, safety director. Miners on the Phillipson level are now using self-service lamp racks with a new type of lamp that furnishes 30 percent more light. As each miner replaces his lamp—one of 540—in the rack at the end of a shift it is recharged for the next day's work.

Utah Development Company has leased property in the Lake Mary area of the Brighton mining district east of Salt Lake City, Utah, from both **Great Western Mines, Inc.** and **Miller Hill Mining Company**. The Utah company, a subsidiary of **Utah Construction and Mining Company**, plans to explore and hopes to develop an open-pit iron ore property in the region above Alpine Lodge in the east end of the Brighton Basin. About 3,000 acres of patented mining claims will be explored, with work scheduled to start in the spring. **Utah Development** also holds an option to purchase the properties and has until January 1963 to complete a minimum of $70,000 of prospect and exploration work on the properties.

Three Salt Lake City, Utah, men bid a total of $3,262 for least of 2,509 acres of federal phosphate lands six miles southeast of Manila in Daggett County, Utah. The men are J. H. Morgan Sr., J. H. Morgan, Jr., and Clarence I. Justheim. A bid of $2,509 was made by **San Francisco Chemical Company** of Montpelier, Idaho, which was the only bidder for another tract of 2,373 acres in the same general area of the phosphate deposit known as the Flaming Gorge. **San Francisco Chemical**, which is 50 percent controlled by **Stauffer Chemical Corporation**, bid $1.00 an acre or $2,373 for the second tract. (See map in MINING WORLD, December 1959, page 48).

Uranium Reduction Company processed 560,366 tons of uranium ore during fiscal 1959 at its Moab, Utah, mill, one of the largest in the nation. The previous year's production figure was 651,676 tons. Total sales exceeded those for 1958. **American Zinc Lead and Smelting Company** of St. Louis, Missouri, headed by Howard L. Young, manages the milling operation for Uranium Reduction, which has contracts with the Atomic Energy Commission that run until 1966. According to Mr. Young, the new 1966 AEC contract will result in a total delivery to AEC of uranium concentrates amounting to 34,214,390 pounds valued at about $275,000,000. Ureco is now operating its new $2,350,000 Alkaline leach circuit, for which the AEC will reimburse a portion of the cost. The milling firm has signed amended ore contracts incorporating specific annual rates of delivery with **Utex Exploratory Corporation, Hidden Splendor Mining Company, Radorock Resources Inc.**, and **Hecla Mining Company**. Uranium Reduction Company plans to mine its low-grade Mamie claims by driving a tunnel from the **Columbia Shaft** of the **Hidden Splendor Mining Company**, formerly **Lisbon Uranium Company**. Production at the **Mamie** claim started early this year, with all the ore scheduled to be mined out by March 31, 1962.

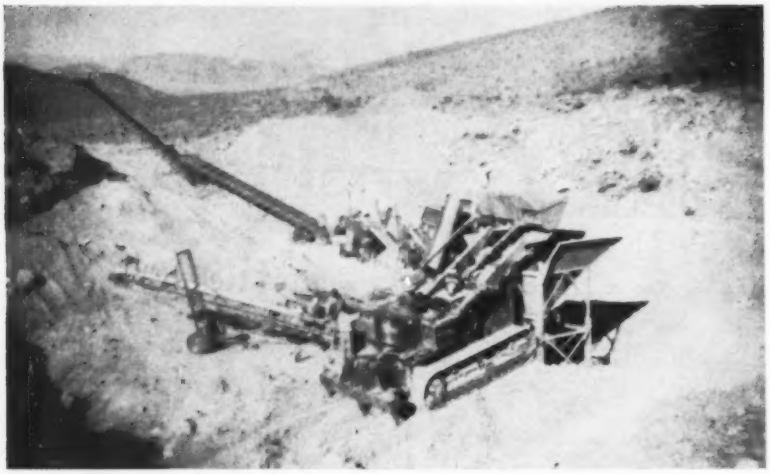
Operations at the **Shattuck Denn Mining Company's** Barden Shaft are expected to cease soon because uranium ore reserves are depleted. The operation eight miles south of the Big Indian uranium district in northern San Juan County, Utah, began production early last year with an estimated reserve of about 27,000 tons. **Shattuck Denn** has mined under contract with **Kerr McGee Oil Industries**, Inc., owner, at the rate of about 3,500 tons monthly.

An agreement to supply two metric tons of uranium oxide to the official **Japan Atomic Fuels Corporation** has been announced by **Western Nuclear, Inc.**, of Jeffrey City, Wyoming. The uranium will be used in experimental reactors for producing electric power. Bids from Canadian and South African uranium producers had been reviewed before the contract was awarded to Western Nuclear, said Glen T. Sakai of **C. Itoh and Company**, New York, which represented the Japanese government agency in the sale. According to Robert W. Adams, president of **Western Nuclear**, the domestic uranium industry has now progressed to the point where an aggressive program can be carried on to help European and Asiatic nations develop atomic power. **Western Nuclear** operates mines in the Gas Hills area of Wyoming and a mill at Jeffrey City.

Shareholders of **Utah Construction & Mining Company** and **Lucky Mc Uranium Corporation** met January 28-29 to approve the merger of the Lucky Mc firm into Utah Construction. Directors earlier approved the agreement which will consolidate uranium operations of the two firms and facilitate development and diversification. Lucky Mc, which conducts a large uranium mining and milling operation in the Gas Hills region near Roverton, Wyoming, is headed by Allen D. Christensen, also president of Utah Construction.

A second 100-ton-per-day sulfuric acid plant is nearing completion at the Riverton, Wyoming, uranium mill of **Susquehanna-Western Inc.** Production is scheduled to start this month. Products will be used in the firm's own operation, as well as sold to other companies. Formerly **Fremont Minerals, Inc.**, the Riverton firm is a subsidiary of the **Susquehanna Corporation of Chicago.** Its $5,000,000 mill began production early last year.

During the 11 months ended November 30, 1959, ore sold from the **Radon** uranium mine of **Hecla Mining Company** near Moab, Utah, totalled 43,917 tons, with an average assay of 0.698 percent U_3O_8. An additional 12,743 tons of ore were mined and stockpiled. Since Hecla operates the mine for **Radorock Resources, Inc.**, 25 percent of each amount was for Hecla's account. During the same period, production from the Hot Rock Group amounted to 5,977 tons of ore assaying 0.350 percent U_3O_8, all sold for Hecla's account.



Base Metals Build Prototype Dry Placer Unit

Recovery of from 75 to 85 percent of the gold in the feed is claimed for the new type of dry placering equipment pictured above. W. F. King, president of Base Metals Production, Inc. with headquarters in Las Vegas, Nevada, reports that the unit with only a 12- to 14-yard-per-hour capacity is too small to be commercial. Therefore, plans call for building a 100-yard-per-hour unit. He estimates operating cost of the larger unit at $0.23 to $0.25 cents per yard. The Allis-Chalmers front end loader is used to dump the gravel directly in feed hopper. It is also used to stockpile oversize boulders from the grizzly.

Homestake Purchases Further Interest in Lance Property

Homestake Mining Company has purchased another 25 percent interest in Lance Corporation's McKinley County, New Mexico, uranium mining properties. The $550,000 transaction gives Homestake a 25 percent interest in Lance's mine nearing production in Section 18, T.15N., R.13W., as well as a 25 percent interest in the remaining 16,000 acres in T.15N., R. 12, 13 and 14W., in McKinley County.

Earlier Homestake purchased for $1,350,000 an interest covering 1,280 acres in Sections 11 and 12, T.15N., R.21W. in McKinley County. (See MINING WORLD, October 1959, page 59, for further details.)

Lance Corporation, a subsidiary of Sabre-Pinon Corporation, will be operator of the properties, acquired from Black Jack Corporation in December 1958.

With the new transaction, Homestake's participation extends to include all Sabre-Pinon and subsidiary properties in the Ambrosia Lake area. Lance's Section 18 mine, included in this transaction, is designed to produce over 300 tons of ore per day with production scheduled to start last month. Some 140,000 tons averaging 0.35 percent U_3O_8 have been blocked out in that section.

ARIZONA

Employes of the **New Cornelia Branch, Phelps Dodge Corporation,** Ajo, Arizona, and employes of affiliated organizations, received rebate checks totaling $278,000 from the New Cornelia Mercantile store. The rebate is computed on the total yearly purchases made at the store. The 1959 rebate amounted to 11.329 percent, highest since 1943. It was distributed to 1,533 employes, with the smallest check for 26 cents, the largest for $613, and the average worker receiving about $300.

Joe Withers of Phoenix, Arizona and three partners have started a small heap-leaching operation at the **Carlota** mine dump near Miami, Arizona. A sulphuric acid solution is used at the dumps and cement copper is precipitated by means of tin cans. Three precipitation vats, each 10 feet long, 3 feet wide, and 4 feet deep, are used with the period of contact about 2½ to 3 hours with hand agitation. The precipitate is said to run 85 to 87 percent copper.

The Buckeye Mica Company, H. G. Smith, manager, Buckeye, Arizona, is running its mill on a three-shift basis, producing over 300 tons per month of mica ground to minus-150-mesh. The product is bagged and goes almost exclusively to the insulation industries. Two "veins" are being mined, the major one being about 18 feet wide and quite clean except for occasional small lenses of quartz or opalite. A crew of six men is employed.

Bagdad Copper Corporation, Bagdad, Arizona, has resumed shipments of copper concentrates to the **American Smelting and Refining Company's** Hayden smelter. The company had been forced to stockpile its concentrates since the start of the strike at the smelter last August. Meanwhile, the mine had been running at full production and had accumulated a backlog of approximately 15,000 tons of concentrates at the railhead in Hillside. Due to the large volume accumulated by Bagdad and other shippers to the Halden smelter, Asarco is accepting shipments on a pro-rata basis only.

Initial construction phases in the $40,000,000 expansion program at **Ray Mines Division** of **Kennecott Copper Corporation** are approaching completion. The fine-ore storage bin being built will hold 15,100 tons of ore (including 2,300 tons of "dead" ore), to be fed into the mill for the copper-extraction process. Other projects are the crusher and transfer house, connected by a 2,000-foot conveyor. The expansion will increase the division's capacity to 22,500 daily tons.

Directors of **Western Gold & Uranium, Inc.,** which owns the **Orphan** uranium mine at Grand Canyon, Arizona, have put the firm's shares on a dividend basis for the first time, declaring a 5 percent stock dividend. Ralph G. Brown, chairman, said the company intends to initiate cash dividends this year. Listing on the American Stock Exchange is also planned soon.

More than 50 men are now working in the **Coronado Copper and Zinc** mine at **Johnson,** near Willcox, Arizona, which became active again last year after a two-year shut-down. Bill Stauffer is superintendent at the mine, leased by **McFarland and Hullinger Mining Company** of Tooele, Utah.

Underground exploration work is continuing at the **Vizina** claim at Tombstone, Arizona, with a crew of four men employed. The Vizina is one of a group of 10 patented and four unpatented claims held under lease or located by Frank J. Frankovich, Phoenix, Arizona. They lie beneath or directly south of the City of Tombstone and include the **Mountain Maid** and the famous old **Million Dollar Stope.** The current underground phase of the exploration program has been in progress since late fall and follows about 3,500 feet of diamond drilling done by Mr. Frankovich last summer. These 17 holes averaged about 200 feet in depth, the deepest hole being 500 feet. The Vizina claim, owned by **Newmont Exploration Company,** is credited with a production of over $500,000 in silver during three years of active operation in the 1880's.

The 17 unpatented claims known as the **Golden Gate Mines, Inc.,** have been purchased by Rhod W. DeLaney, Sonoita, Arizona. The claims are located in Box Canyon, near Greaterville, and considerable exploration and development work had been completed by former owners. The ore carries lead, zinc, and copper.

Exploration work at the **Springfield** mine, near Crown King, Arizona, is continuing with a crew of three employed. The main shaft, reported to be 300 feet deep, has been unwatered and some underground drilling completed. The program is being handled by the **C. T. Mining Company,** with Gil Dobbs of Grants, New Mexico, superintendent in charge.

CALIFORNIA

Jefferson Lake Sulphur Company has awarded a preliminary design contract for its new $5,000,000 asbestos mill to be built near Copperopolis, Calaveras County, California. **Tellepsen Petro-Chem Constructors** of Houston, Texas has received the award. Jefferson Lake

has been diamond drilling the chrysotile deposit since early 1959, has built a pilot plant sampling mill at the property, and made extensive tests on fiber recovery. The **American Asbestos Mining Corporation** leased the property to Jefferson Lake.

Analysis of some 25 samples of rare minerals from the deposit northeast of Johannesburg, California, indicate the deposit may turn out to be one of the largest of its kind in this part of the United States. Samples taken from several pegmatites and contact metamorphic quartzite showed thorium, uranium, titanium, molybdenum, cerium, lanthanum, yttrium, and zirconium, as well as minor quantities of beryllium, silver, and tin. Probably of deep-seated origin, the deposit is being developed by **Miracle Mining Corporation** with Emil Shore, vice president, in charge. Joseph L. Foise is credited with discovery of the rare minerals.

About 15 carloads of hand-sorted, high-grade manganese ore have been shipped since October 1958, from the previously undiscovered deposit near **Shelter Cove** in southwestern Humbolt County, California. The discovery was made in 1958 by Carl Macela, associated with Into Werta, both of Garberville, California. Shortly afterward the **Queens Peak Mining Company** was formed to mine the deposit in which the ore assays about 42 percent manganese, 6 percent iron, and less than 15 percent silica. Located about 3 miles north and 1 mile east of Shelter Cove, the deposit is at least 22 airline miles west from the nearest known producing mine. Consequently its discovery opens up an extensive new area as potential ground for manganese prospecting. Additional discoveries in the area can be expected. The ore is mined in an open cut and as work progressed down the dip, the volume of overburden to be moved increased rapidly. Working face exposed was about 125 feet wide and 200 feet high. Ore was hauled by truck about 45 miles from the mine to the railroad shipping point of South Fork.

Midwest Oil Company of Denver, Colorado, has a 17-section lease and interest in the gold exploration area in Death Valley, California, where **American Zinc, Lead & Smelting Company** of St. Louis, Missouri, has begun churn drilling of gold-bearing gravel (said unofficially to run to depths of 118 feet). Midwest and a subsidiary, **Peerless Gas & Oil**, are continuing assessment work on their holdings, which are reportedly in the midst of a 40- or 50-section area being explored. **Anaconda Lead & Silver Company** of Denver is another company that is reported to hold a 640-acre section in the area. American Zinc, through its subsidiary, **American Zinc Sales Company**, has been exploring an area located about 35 miles northeast of Baker, California.

At the **Eagle Mountain**, California, iron ore mine owned by **Kaiser Steel Company**, a new one-year wage agreement was signed in November that provides for a general increase of 10 cents per hour. The basic contract between the company and mine employees does not expire until next September, but the agreement provided for reopening of the wage discussion subject last September 15. This period was extended until 30 days after production was resumed at Kaiser's Fontana, California, steel plant.

The **Southwest Metals and Minerals Conference** will be held at the Ambassador Hotel in Los Angeles, California, April 21 and 22. Field trips will be arranged for April 23. The program will emphasize metals and materials for the space age, with Dr. Albert C. Hibbs, chief of the division of space sciences at **Jet Propulsion Laboratories**, enhancing this theme with an address at the Annual Banquet. There will also be symposia on boron and rock products, a mining session, discussion on beryllium metallurgy, etc..

The hydraulic mining controversy in California's Sacramento Valley is discussed in a new book by Robert L. Kelley entitled, "Gold vs. Grain". The period covered is from the beginning of hydraulicking in the 1850's to the final control of the program in the '90's, with a chapter on the aftermath and reconstruction to 1956. The author is assistant professor of history at the **University of California** at Santa Barbara. Price is $9.50.

NEVADA

In the continuing exploration and development work by **Belmont Mine Company** on its **El Dorado South** property near the old town of **Belmont, Nevada**, the underground core drilling program has been completed. Mining is now on a two-shift basis with pumping on a 24-hour schedule. Emphasis is on the south drift on the 1,000-foot level of the winze. Heavy ground is being encountered but work is proceeding well, with good time made in cleaning out and retimbering the old workings abondoned in 1878 after a fire.

The **Tonopah Divide Company** is quickly getting its property in the Divide district, south of Tonopah, Nevada, ready for production. Power lines, transformers, and all necessary electrical equipment have been installed and surface machinery has been repaired. Underground, water and air lines and some rails have been installed where required, and the shaft opened up to the 1,000-foot level. According to Jim Smith, superintendent, initial production will come from the 400-foot level where good mill ore is known to be ready for mining. **United States Milling and Mineral Corporation** is running mill tests at Silver Peak, where ore will be trucked if a successful recovery can be made. The Tonopah Divide property's last production was in 1950, when it was under different management.

Apex Minerals Corporation of Reno, Nevada, shipped 800 tons (10 carloads) of uranium ore to **Vitro Uranium Company** of Salt Lake City, Utah, during December, and 17 carloads during the two previous months. The company has

Wherever Ore Moves, SCOOT-CRETE

Ore Carriers Move It • FASTER • EASIER • AT LOWER COST

SCOOT-CRETE CD-4, shown being loaded in mine, will carry up to 15 tons payload. Model CD-3N has 5-ton payload. Note driver's side-mounted position for maximum vision and efficiency, forward and rear.

Throughout the world, **SCOOT-CRETE gives top-rate performance. No rails needed, no ties, no cars, no independent power source. Diesel-powered for operation inside the mine, SCOOT-CRETE carriers are rugged for around-the-clock service; carry up to 15 tons at speeds to 15 mph, climb grades up to 18%. Available with standard or fully automatic transmission. SCOOT-CRETE has equal speeds forward and reverse for fast shuttle service. All CD models approved by U.S. Bureau of Mines for underground mining.**

Units available from 3,000 lb. to 15-ton capacity. Write for specifications and literature. See your Dealer.

GETMAN BROTHERS

SOUTH HAVEN, ZONE 5, MICHIGAN

completed its new incline shaft for a total depth of 143 feet. When a crosscut was driven from this shaft easterly for 88 feet, a raise broke into the stope from which the company had been shipping previously showing that they were in the hanging wall of the vein. A crosscut was then made from a point 25 feet up this raise for 55 feet to the footwall of the ore body lying above an aplite dike. At that point 10 feet of ore have been crosscutted, which assayed in excess of 0.40 percent U_3O_8 and on this level 300 tons, with an average value of 0.45 U_3O_8, have been mined. The company raised from this point on the ore body southeast along an aplite dike for 100 feet. The raise is about 10 feet wide by 8 feet high. All of this development ore averaged from 0.25 to 0.35 percent U_3O_8. A crosscut and drift have also been driven on the shaft level to the south and east of the previous crosscut in which values were uncovered in two places, where stoping is planned. Stoping is also being carried on in the coffenite stope above "A" level. Apex hopes to increase its tonnage to Vitro to 1,500 tons by March 1, and to 3,000 tons by July 1.

In Southern Nevada, **Round Mountain Gold Dredging Corporation** announced its shutdown in mid-December, stating that it "may or may not reopen in the spring." Unlike a shutdown in February 1959, because of severe weather, in this year's closure the company will make no effort to keep the work force in Round Mountain and will maintain only a small maintenance crew. In Silver Peak, Nevada, there have been indications of renewed activity at the **Mohawk** mine of **United States Milling and Mineral Corporation**, as well as reported high values at the **Tonopah King** mine. The Mohawk mine shut down because of a cave-in in October, reopened soon afterwards, and has been working two shifts on three headings. Sources indicate miners have made 100 feet on the 200 drift and 28 feet on the crosscut recently. The Silver Peak mill was closed briefly in December for routine repairs, but reopened in late December with increased production.

January 1 was the scheduled starting date for a custom milling plant built in northern Elko county, Nevada, by the **Bodganich Development Company** of Salt Lake City, Utah. The company has acquired several lead, gold, and silver mining claims in the Gold Creek-Rose Bud Mountain area. The mining operation will continue through the winter, as weather permits, but ore is now being stockpiled at Mountain City, Nevada, for processing. A stockpiling area, ore bins, the mill settling vat, tailing-pond, and an assay office will comprise the milling facility, which will employ about 10 men and have a 75-ton daily capacity.

NEW MEXICO

Under a stretch-out plan agreed to by the **Atomic Energy Commission** and the **Anaconda Company**, operator of the Bluewater, New Mexico, uranium processing mill, the mill will operate six days a week at a rate of up to about 3,000 tons of ore a day, depending on the grade. Previously the mill operated seven days weekly at a daily rate of about 3,500 tons. When Anaconda completes concentrate deliveries under the contract in 1966, it will have mined and processed less than half its ore reserves developed before November 24, 1958. The contract is effective as of last May 1, and extends to December 31, 1966. Under its terms, about 4,000,000 pounds of U_3O_8 will be deferred to the 1962-1966 period. First contract for the Bluewater mill was signed in December 1951, and the mill went into production in September 1953.

Mining operations of **International Minerals and Chemical Corporation's** Potash Division at Carlsbad, New Mexico, have returned to the 800-foot level, which has been idle since 1948. Exploration has revealed that northward and eastward from the areas last mined on that level, the langbeinite stratum becomes thinner and the sylvite deposit increases. Development crews are now working around the clock, opening three entries into the new area. Selective mining is followed to recover both types of ore.

The Atomic Energy Commission has extended its uranium concentrate purchase contract with **Kerr-McGee Oil Industries, Inc.**, for continued operation of the 300-ton-per-day processing mill at Shiprock, New Mexico. The new contract will run until June 30, 1965 or earlier if required deliveries have been made. A new solvent extraction circuit at the plant scheduled for completion this month will make it possible to recover high purity vanadium concentrate (about 99 percent V_2O_5) as well as uranium concentrate from the Shiprock ores. About 85 percent of the ore processed by the mill comes from mines on the Navajo Indian Reservation. Most of the mill and mine employees are Navajos.

The perlite ore deposit and mill 70 miles north of Santa Fe at No Agua, New Mexico is among **Johns-Manville Corporation** perlite operations involved in a transfer of management responsibility. The **J-M Celite Division** will operate the New Mexico facilities, one at Antonio, Colorado, and a perlite plant at Joliet, Illinois. M. B. Michelson, who has been plant manager at the New Mexico and Colorado perlite operations since production started there after World War II, will continue in that capacity. Johns-Manville acquired the perlite activities from the former **F. E. Schundler & Co., Inc.**, of Joliet, Illinois, last year.

Western Smelting and Refining Corporation has been organized in Belen, New Mexico to provide custom smelting and refining facilties for gold, silver, and platinum metals mined in the Albuquerque area. Clifford G. Taylor, president, is also head of **International Uranium Corporation**, owner and operator of 14 mining leases and a new 100-ton-per-day mill at about 14 miles east of Isleta in northeast Valencia County. The two firms reportedly will merge eventually.

WORLDWIDE PROFESSIONAL DIRECTORY

HARRY B. CANNON ASSOCIATES
Geologists — Engineers
Exploration — Ore Dressing
Specialists in Heavy Minerals
P.O. Box 2432 — Lakeland, Florida

COOKE, EVERETT & ASSOCIATES
CONSULTING GEOLOGISTS
Examinations—Exploration—Research
Photogeology—Valuations—Surveys
P. O. Box 2229 Reno, Nevada, U. S. A.
Telephone: FAirview 9-1766
Cable Address: COVER

ABBOT A. HANKS, INC.
ESTABLISHED 1866
ASSAYERS—CHEMISTS—ENGINEERS
Supervision of Sampling at Smelters and Shipping Points
Control and Umpire Assays
SPECTROGRAPHIC ANALYSIS
Inspection and Tests of Structural Materials
1300 Sansome Street — SAN FRANCISCO 11
Telephone EX 7-2464 — Cable Address: HANX

E. J. LONGYEAR CO.
Geological and Mining Consultants
Photogeology
76 South 8th Street ..... Minneapolis, Minn.
Graybar Bldg. ..... New York 17, N. Y.
Colorado Bldg. ..... Denver 2, Colo.
Shoreham Bldg. ..... Wash. 5, D. C.
129 Ave. de Champs-Elysees ..... Paris, France

ASSAYS. Complete, accurate, guaranteed. Highest quality spectographic. $8 per sample. Reed Engineering, 620-Y S. Inglewood Ave., Inglewood 1, Calif.

CONTRACT CORE DRILLING

EXPLORATION FOR MINERAL DEPOSITS
INCLUDING URANIUM & LIMESTONE — ANYWHERE
FOUNDATION TEST BORING
GROUT HOLE DRILLING
Skilled crews and complete stock of core drills and accessory equipment maintained at all times
Core Drill Contractors for more than 60 years
JOY MANUFACTURING CO.
Contract Core Drill Division
MICHIGAN CITY, INDIANA

Watch for your copy of the new CATALOG, SURVEY and DIRECTORY NUMBER coming soon!

PROFESSIONAL DIRECTORY

One-Inch Card, $90 Yearly—½-Inch, $60 Yearly, Payable in Advance.

CONSULTING ENGINEERS

JOHN L. ALEXANDER
Mining Consultant
MEXICO
Apdo. Postal 54
Caborca, Sonora, Mexico.
Telephone #9

BURBRIDGE—PYBURN
Consulting Engineers & Geologists
Mining—Petroleum
Southwestern U. S. & Latin America
Mills Bldg., El Paso, Texas—Tel. KE 3-4741

CHAPMAN, WOOD AND GRISWOLD
Mining Engineers & Geologists
Appraisals, Exploration & Development
Assaying
P.O. Box 8302 — Albuquerque, N. M.
Wagner Building — 530 Jefferson, NE
ALpine 6-1675

COWIN & CO., INC.
Mining Engineers and Contractors • Consulting Appraisal Reports • Shaft & Slope Sinking • Mine Development • Mine Plant Construction.
1-18th Street, S. W. Birmingham, Ala
Phone ST 6-5566

C. P. KEEGEL
Mining & Metallurgical Engineer
Administration — Appraisal
1721 So. Fourteenth St. Tel. DUdley 4-6981
Las Vegas, Nevada

KELLOGG EXPLORATION COMPANY
GEOLOGISTS—GEOPHYSICISTS
Electromagnetic
Magnetic — Radioactivity
AERIAL SURVEYS — PHOTOGEOLOGY
3301 North Marengo Avenue
Altadena, California — Sycamore 4-1973

LOTTRIDGE-THOMAS & ASSOCIATES
Professional Engineers
705 Judge Building
SALT LAKE CITY 11, UTAH

MESABI ENGINEERING
711 NEW YORK BLDG.
ST. PAUL 1, MINN.
CA. 4-8833
MECHANICAL ENGINEERS, DESIGNERS, CONSULTANTS
MECHANICAL EQUIPMENT FOR THE CONTRACTING AND MINING INDUSTRY—ENGINEERED TO SUIT SPECIAL JOB REQUIREMENTS

STILL & STILL
Consulting Mining Engineers and Geologists
Room 24 Union Block — Prescott, Arizona

O'DONNELL & SCHMIDT
Mining Consultants
165 Broadway — Tel. BArclay 7-6960
New York 6, N. Y. — Cables: EXAMIMINES

NEIL A. RICE
Mining Consultant-Registered Engineer. Examinations, Valuations, Mining Methods, Cost Cutting Surveys, Mineral and Oil and Gas leases.
512 E. Roanoke Ave. — AMherst 5-7854
Phoenix, Arizona

C. H. THURMAN • F. M. BLANCHARD
BUCKET LINE PLACER DREDGES & DRAGLINE WITH FLOATING WASHING PLANT.
Dismantling — Moving — Redesign — Rebuilding — Prospecting — Operation — Management
112 Market Street — San Francisco, Cal.
Phone: EX 2-8260 — Cable: THURCONS

TURNER & ASSOCIATES
Consulting Mining and Water Geologists
350 East Camelback Road, Phoenix, Arizona
Crestwood 4-2262

WISSER AND COX
GEOLOGISTS—ENGINEERS
investigations and consultation
RESOURCES—EXPLORATION—OPERATIONS
VALUATIONS—INVESTMENTS—UTILIZATION
55 New Montgomery St., San Francisco, California
YUkon 2-1436 — cables: GEOLOG

CHEMISTS, SAMPLERS, SHIPPERS' REP'S

ARIZONA TESTING LABS
Chemists — Spectroscopists — Assayers
Box 1888 — 817 W. Madison — Phoenix
Box 2508 — 1516 East 20 St. — Tucson

ORE SHIPPERS' REPRESENTATIVES
at Smelters & Seaports
(Pacific Northwest)
Samplers — Assayers
BENNETTS CHEMICAL LABORATORY, INC.
901 So. 9th — Tacoma 5, Wash.
Est. 1913 — Inquiries Welcome

THE COLORADO ASSAYING CO.
ASSAYERS, CHEMISTS and SPECTROGRAPHERS
Est. 1900
Gold and Silver $2, Copper $1, Uranium $7.50. Send for free copy of our Mineralogist Pocket Reference Giving Detailed Information on all Principal Ores.
2244 BROADWAY—ALSO P.O. BOX 298
DENVER 1, COLORADO

DICKINSON LABORATORIES, Inc.
Assayers—Chemists—Metallurgists—Umpires
Shippers Representatives at Local Smelters
Representatives at Mexican Border
Points for Shippers of Manganese and Fluorspar
P.O. Box 7006 — El Paso, Texas

GOODALL BROTHERS
ASSAYERS AND CHEMISTS
SHIPPERS' REPRESENTATIVES
Helena — Established 1909 — Montana

Wood Assaying Co., Henry E.
Established 1878
ASSAYERS and CHEMISTS
733 W. Colfax — Denver 4, Colorado

DRILLING COMPANIES

DIAMOND DRILL
Contracting Company
S. 18 Stone, Spokane 31, Wash.
- "SUPER PIONEER" hand portable core drills
- "K & S INTERNATIONAL" standard surface drills
- "DIA-HARD" Core Barrels
- And a complete line of "Super Pioneer" and standard diamond drilling accessories.

R. S. MC CLINTOCK CO.
Diamond Core Drilling
Diamond Core Bits & Accessories
Spokane, Wash. — Globe, Arizona

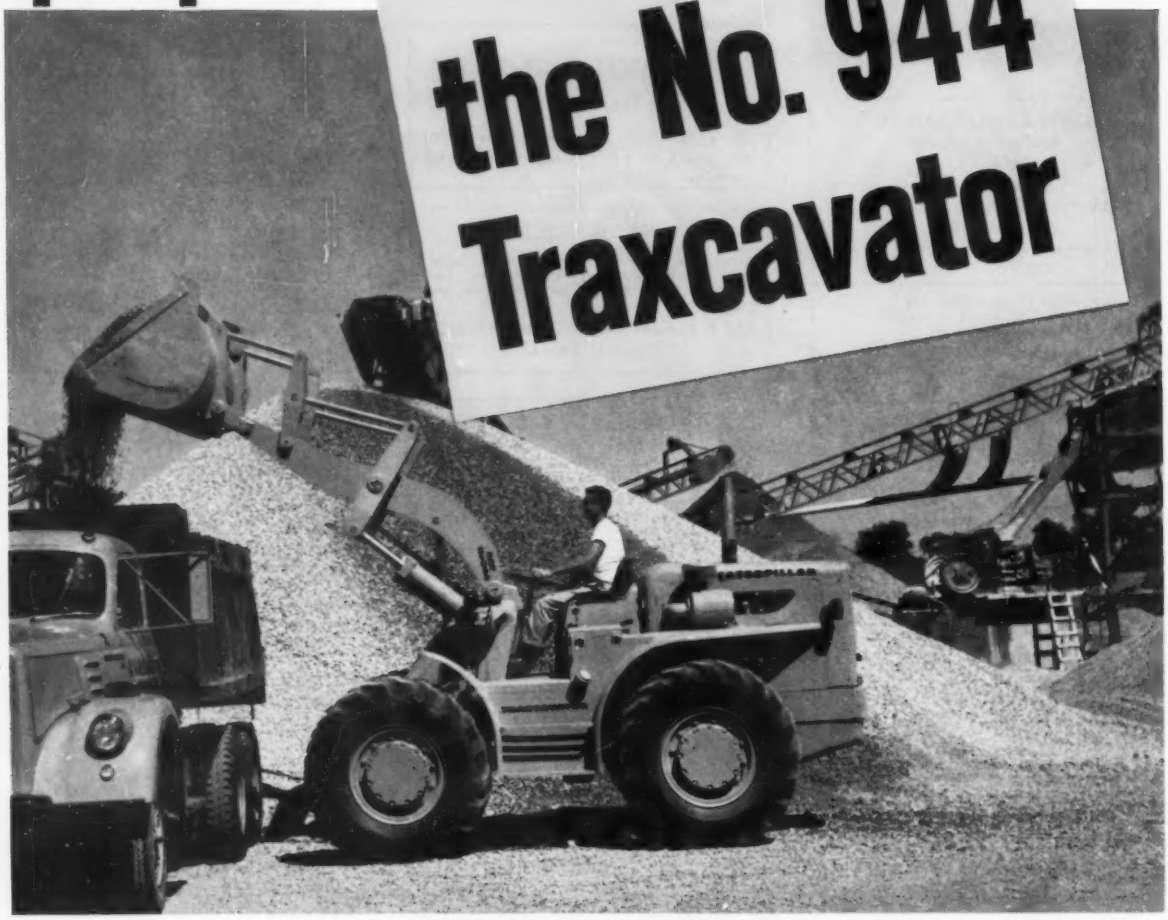
EXPLORATORY DRILLING—GROUTING
ROCK BREAKING
J. F. WHALEN
Mining Engineer
Available for Consultation on Exploration & Mining Problems
P. O. Box 4056
Boise, Idaho — Phone 4-0098

VAUGHAN DIAMOND DRILLING
World-Wide Consultants
Foundation, Grouting, Core Drilling, Wedging and Recovering Hole. We are in the Business for Trouble and have Experienced Trouble-Shooters for every job.
Head Office: Beaverdell, B. C., Canada
Cable: Vaughan

NEW

FROM CATERPILLAR!

the No. 944 Traxcavator



Here is a wheel loader with bold, new design from the builders of the world's best accepted track-type tractor-shovels in the field!

Every feature is designed for efficient work. Finger-tip shifting...smooth, fast bucket action...adequate power...outstanding operator comfort and safety!

GET THE DETAILS FROM YOUR CATERPILLAR DEALER SOON!

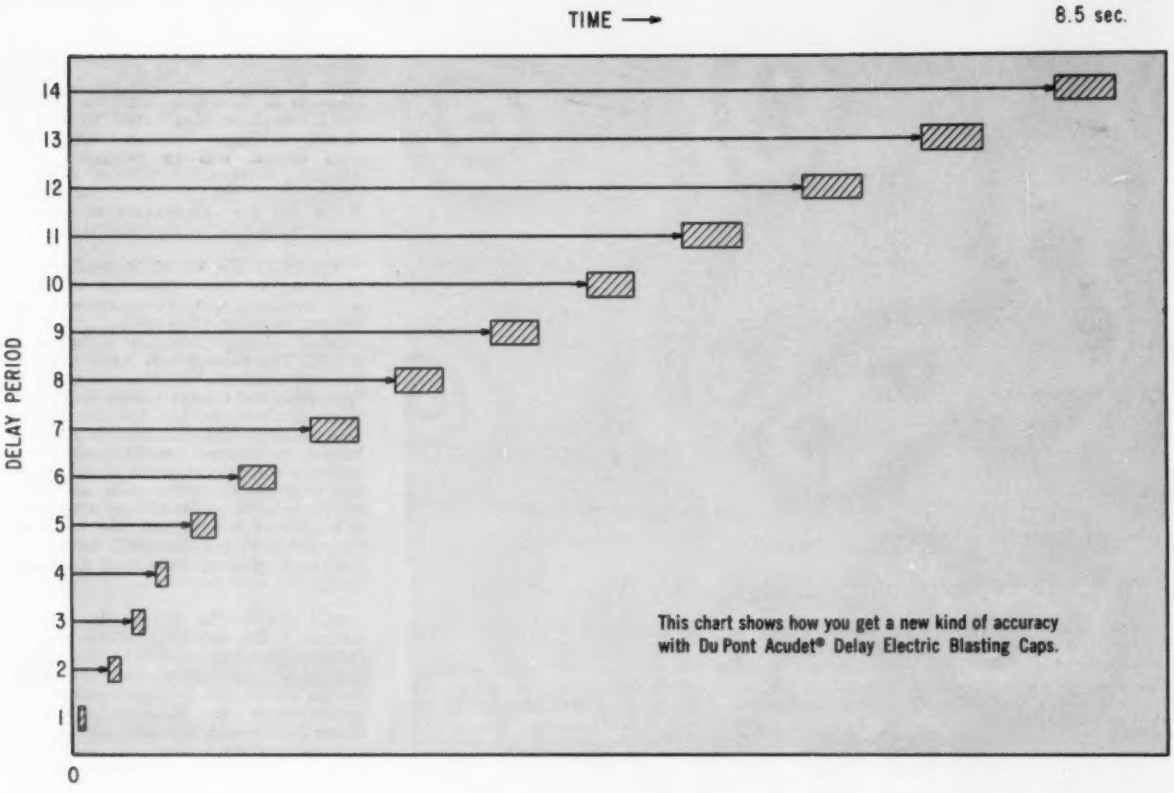
CATERPILLAR

Caterpillar, Cat and Traxcavator are Registered Trademarks of Caterpillar Tractor Co.

DIESEL ENGINES • TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

A GREAT NEW PRODUCT IN THE CATERPILLAR TRADITION

Caterpillar Tractor Co., General Offices, Peoria, Illinois, U.S.A. • Caterpillar Americas Co., Peoria, Illinois, U.S.A. • Caterpillar Overseas C.A., Caracas, Venezuela • Caterpillar of Australia Pty. Ltd., Melbourne • Caterpillar Brasil S.A., São Paulo • Caterpillar Tractor Co. Ltd., Glasgow, Scotland • Caterpillar of Canada Ltd., Toronto, Ontario



New Du Pont Delay Electric Blasting Caps eliminate all possibility of overlap...provide ample time for rock movement between periods

Du Pont's new series of delay electric blasting caps is made to fire with a definite time gap between the slowest cap of any period and the fastest cap of the next highest period. This not only eliminates all possibility of overlap, but also provides ample time for rock movement between periods. This makes the Du Pont Acudet Delay a major forward step in delay blasting control. Manufactured by mechanical assembly to closer timing tolerances than ever before possible, this new series assures a positive time gap of 1/10 to 1/2 second (see the graph above) between periods through the entire series of 14 delays.

The timing of each period and the length of the time gap between periods have been carefully selected to give optimum blasting results under all conditions. For instance, the time gap between the first and second delays is made long enough to insure the rock from the cut being out of the way before the first relievers go.

In the few months that they have been in the field, Du Pont Acudet Delays have been widely and enthusiastically accepted. Experience in a variety of operations has confirmed these advantages:

1. **Less bootleg**—more advance per round
2. **More uniform fragmentation**—easier mucking
3. **Less overbreak**—better shearing action
4. **Shorter shells**—easier to make primers
5. **Aluminum shells**—corrosion resistant
6. **First period fires in 1/40 second**—no need for special timing or circuit breaking equipment.

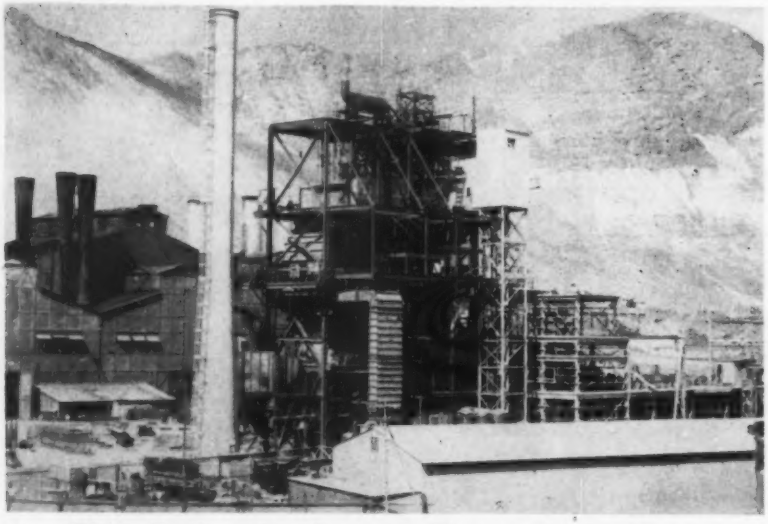
Like all other Du Pont Electric Blasting Caps Acudet Delays are mechanically assembled with nylon plastic insulation, rubber plug closures, and shielded shunts.

Ask your Du Pont representative *now* for detailed information on the phenomenal accuracy of Acudet Delays and what this means for you in your operation.

Call him direct or write to Du Pont, Explosives Department, 6440 Nemours Building, Wilmington 98, Delaware.

DU PONT REG. U.S. PAT. OFF. **EXPLOSIVES**

BETTER THINGS FOR BETTER LIVING...*through Chemistry*



Chile Exploration Expands Electric Power Plant

A new 375,000-pound capacity steam boiler is pictured here as it is being erected at Tocopilla, Chile by Anaconda Company's subsidiary—Chile Exploration Company. The new Babcock & Wilcox boiler will produce steam to generate power for transmission to the company's Chuquicamata open-pit copper mine, and metallurgical plants in the interior of Chile. The boiler will produce steam at a pressure of 1,850 pounds per square inch and a temperature of 1,050° F. at the superheater outlet. The reheat temperature will be 1,000° F. Designed for a pressure of 2,100 pounds per square inch, the unit will have a maximum four-hour peak load capacity of 390,000 pounds of steam per hour. Engineered as an oil-fired, pressure-cased boiler, which eliminates the need for induced draft fans, the unit will consume 3,390 gallons of oil per hour in serving a 50,000-kilowatt turbine generator. Both the boiler and turbine are being erected as outdoor installations.

Surigao To Resume Export Of Zinc Concentrate in 1960

Exporting of zinc concentrate, discontinued after 1953, will be resumed shortly by Surigao Consolidated Mining Co., Inc., which operates a gold-silver-zinc mine in Mindanao. The firm has stockpiled nearly 100,000 tons of zinc-pyrite concentrates in the intervening period.

The company exported some 7,870 tons of concentrates, containing a total of 8,330,298 pounds of zinc, during 1952 and 1953, but discontinued the practice because of the world market price deterioration. Since the price has increased somewhat recently and the company may possibly obtain a barter license for export, Surigao Consolidated has contracted for sale of 15,000 tons of zinc concentrate to Philipp Brothers Far East, Inc., New York, New York.

Arrangements are under way for separation, by flotation, of the zinc from the zinc-pyrite concentrates to yield a 49 percent zinc concentrate for export.

CUBA—The new mining law, which sharply increases taxes on the mining and export of minerals and mineral concentrates, is blamed for the virtual halting of nickel production here. Not only has Cuba fallen short of its plans to produce some 100,000,000 pounds of nickel yearly, but by the end of the year exports had practically halted. The 50,000,000-pound-per-year Nicaro nickel plant owned by the United States government ceased shipments because of the tax situation and the huge new $75,000,000 nickel plant of **Freeport Sulphur Company** did not start shipping as scheduled. That firm's **Moa Bay Mining Company** has also been adversely affected by the tax law and by other restrictions of Premier Fidel Castro. Company officials find interpretation of the laws difficult, but if the new taxes are applied strictly neither Nicaro nor Freeport would be able to operate profitably. World consumption of nickel increased to about 400,000,000 pounds in 1959, while total free world capacity of some 525,000,000 pounds rose only slightly, so that Cuba's potential output would eventually find a good market.

MEXICO—**Zincamex, S. A.,** is a company formed recently with plans to build a zinc refining plant in central Mexico. Financing proposals have been received from Belgium and Germany and a study is under way to make the facility a three-way project with foreign, Mexican private capital, and State participation. The type of process to be used at the plant is also being studied.

BRAZIL—**Societe Morro do Niquel** was formed recently to mine a nickel deposit in the state of Minas Gerais. French interests in the concern are **Societe Le Nickel,** which is mining nickel deposits in New Caledonia; the **Banque de L'Indochino,** and **Credit Foncier du Bresil,** the Franco-Brazilian banking firm. The deposit will be purchased from **Minneracao Sertaneja S.A.** of Brazil in exchange for 50 percent of the capital. Plans call for construction of a ferro-nickel plant by Societe Le Nickel.

MEXICO—Dr. W. N. McAnulty, chief geologist for **Dow Chemical Company** and **Dominicia, S. A.,** Dow's Mexican subsidiary, spoke in Mexico City at the December meeting of the local chapter of AIME. His subject was Fluorspar Deposits in Coahuila," with emphasis on the **Aguachile** and **Cuatro Palmas** deposits in northern Coahuila. Ing. Savador F. Trevino, manager of **Commision de Fomento Minero,** introduced Dr. McAnulty, who said that fluorspar deposits are abundant and widespread in that area, all ore is relatively high grade, and in some areas it is acid-grade as mined. The ore averages about 75 percent CaF_2, 18 percent $CaCO_3$, 5 percent SiO_2, and 2 percent R_2O_3.

ECUADOR—**The Oficina de Asesoramiento y Representaciones Mineras** at Edificio Cruz Roja—8° Pesa—Quito, Ecuador, is offering an expanded information service about mineral development and opportunities in Ecuador. Cristobal Ponce R., Gerente, has established a special information section and would be glad to correspond with companies that want to investigate mining opportunities, or undertake mineral development programs in this country.

VENEZUELA—Iron ore concessions now total about 120,289 acres, according to the **Ministry of Mines and Hydrocarbons.** Concessions are granted in one of two ways: either through claims granted by the government, or through contracts in Reserved Zones based on the provisions established by the Law of Mines. These are granted at the discretion of the National Executive and the government may retain special advantages. Of the present concession areas, 94.9 percent were acquired through mining claims. The remaining 5.1 percent is represented by the **Piacoa** 6,175-acre concession which was granted by a contract in 1946. Most of the concessions are in Bolivar state; a few are in Miranda and Monagas.

CHILE—More than 1,000,000,000 tons of iron ore is now estimated in the **El Laco** deposit owned by **Compania Minera Santa Fe.** The deposit consists of four large ore bodies, **Laco Norte, Laco Sur, Tuyajto Este,** and **Tuyajto Oeste,** all within a three-mile radius. Iron content averages between 66 and 69 percent. Survey studies are underway to determine the layout for construction of a railroad, port, and installations necessary for development of the mine. To accomplish this, a large investment is required. A mining camp able to house 10,000 persons would be needed; approximately 400 kilometers of railroad would have to be laid, as well as a mechanized seaport with a capacity of 5,000 tons per hour.

VENEZUELA—Reports of a thorium discovery on Capure Island, Delta Amacuro Federal Territory, on the southern

shores of the Gulf of Paria in eastern Venezuela, indicate the material occurs in large quantity. Studies of possible means of developing the deposit are now under way.

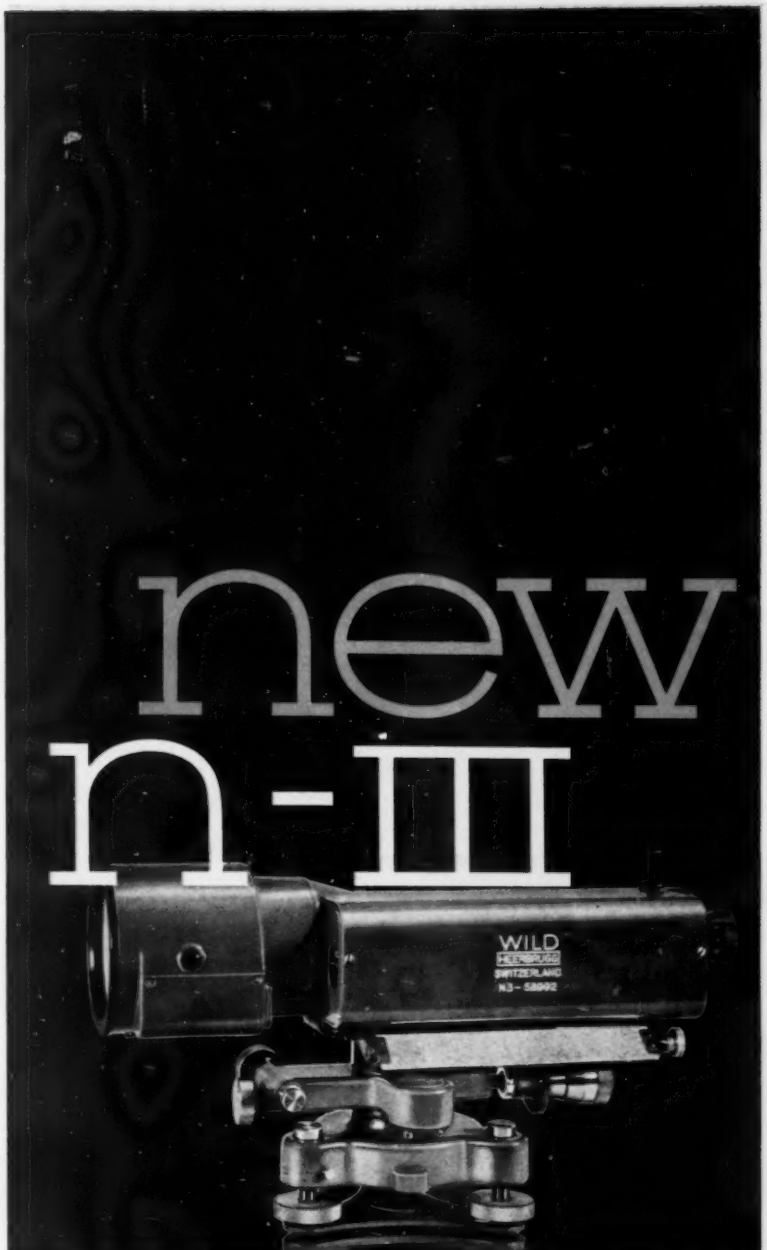
ARGENTINA—**Boroquimica Limitada** has set up a borax plant at Campo Quijano, Salta near the rich deposits of Puna de Atacama. This firm plans to export boron derivatives and eventually to produce anhydrous borax and boric acid.

VENEZUELA—Iron ore production increased 10.3 percent and diamond output 45.75 percent during the first half of 1959, compared with the same period of the previous year. **Iron ore** output was 7,975,150 metric tons in the first six months of 1959, and diamond output was 60,495 carats. Other mineral production decreased—asbestos, down 33.3 percent to 2,694 metric tons; gold, down 22.3 percent to 909,077 grams; nickel, down 31.1 percent to 739 metric tons. Heavy rainfall was responsible for the drop in gold production; mills were not able to operate at full capacity.

TURKEY—Purchase of equipment to increase ore output from its **Divrigi** mines will be one phase of an expansion program for **Karabuk Iron & Steel Works** with the assistance of a $15,000,000 credit from the United States **Export-Import Bank.** The company will purchase heavy United States equipment, materials and technical services needed for a complete structural steel fabricating shop, construction of new iron and steel furnaces, auxiliary rolling mill equipment, and a supplementary water circulating system. The program calls for increasing steel ingot capacity to 600,000 tons and more than doubling iron ore production to 1,100,000 tons per year by 1962. Only integrated steel producing facility in Turkey, the Karabuk Works is on the Saganli River about 167 miles north of Ankara.

MALAYA—**Rantau Tin Dredging Company Ltd.,** which has had to operate both its Nos. 1 and 2 dredges only intermittently during last year, reports that the No. 1 dredge will now operate on a continuous basis. The second one will remain closed down until higher tin quotas justify resuming operations. Estimates indicate that the remaining tin reserve will provide five more years of operating life for the No. 1 dredge, plus a two-year life for No. 2. Efforts are being made to acquire suitable new ground so they can be put to fuller use.

CYPRUS—Major modifications of its treatment plant and introduction of an all-flotation system have been completed by the **Esperanza Copper and Sulphur Co. Ltd.** The plant is now operating with an initial estimated output of 180,000 tons per year of Limni section semi-oxidized ore. The new plant will produce good grade copper-gold-silver concentrates that have a ready and profitable



THE WILD N-III HIGH PRECISION LEVEL is universally accepted as the standard wherever absolute accuracy, dependability and ruggedness are paramount considerations. The N-III is easy and quick to set up and operate.

Three models are available to meet both field and industrial re-requirements, reading direct to .1 mm; .001 inch; .0005 ft.

All have tilting screw, coincidence level and built-in optical micrometer.

Write for Booklet N-III.

WILD
HEERBRUGG
INSTRUMENTS, INC.
Main at Covert St. • Port Washington, N.Y. • POrt Washington 7-4843
FULL FACTORY SERVICES

market unaffected by fluctuations and demand in price of pyrite. The plant will also recover a substantial quantity of copper as a byproduct from precipitate-soluble ore being treated, making separate leaching unnecessary.

MALAYA—Following the increase in the export quota for tin, a total of 41 Malayan tin mines were scheduled to re-open in January. Two new mines have also been authorized to begin work. Official figures show that at the end of last October, 22 more tin mines were operating than at the end of September.

KOREA—The new synthetic scheelite refinery at the **Sangdong** scheelite mine of the **Korean Tungsten Mining Company** produced 60 tons of 90 percent of scheelite concentrates in its pilot production run recently. Regular production plans call for 180 tons of scheelite concentrates per month.

INDIA—Japan, the largest buyer of Indian ore, is understood to have indicated to India that she will require 4,000,000 tons of this ore annually from 1964 onward for a period of ten years. This is in addition to the arrangement made between the **State Trading Corporation** and the Japanese steel mills under which the latter are to buy 2,000,000 tons of iron ore annually from 1964 to 1974. At present, Japan is buying the ore under a long-term contract concluded in 1957, which provides that Japan will purchase 7,200,000 tons during five years ending June 1962.

MALAYA—**Kamunting Tin Dredging Ltd.** will use a large part of its substantial capital reserve to transfer the No. 6 dredge to an area acquired from **Taiping Rubber Company.** It will start in about two years and will take about 18 months to complete, during which time production will be affected. The No. 1 dredge, which has been on a care and maintenance basis since 1953, has been sold for scrap since it was not possible to find a suitable area where this dredge could be worked.

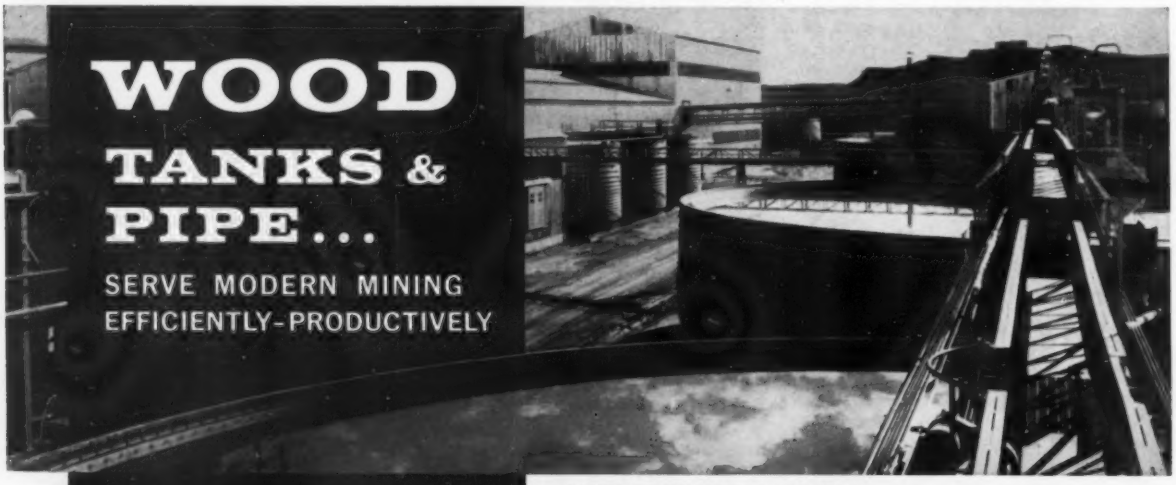
ISRAEL—The Minister of Development reports that the country expects to export about 100,000 tons of phosphate in the current fiscal year, as compared with 40,000 tons in the previous year. A new flotation plant is being brought into operation at Oron which will raise the phosphorus pentoxide content of the phosphate from 28 to 31 percent. The **Zanzibar Company** in the United States formed an expansion plan for the **Dead Sea Potash Works,** according to the Minister, Mordecai Bentov, which could increase the plant's annual production capacity from a present 135,000 tons to 600,000 tons.

JAPAN—Believing that the present increasing demand for aluminum will be the trend for some time to come, Japanese aluminum manufacturers are planning to increase their production capacity over the next three years. Specifically, the output of 1959 which was 103,000 tons, will be increased to 136,000 in fiscal 1960, 160,000 in 1961, and 200,000 in 1962. The major producers have made their plans as follows: **Nihon Light Metals Company** will increase from the present 52,000 tons to 91,000 tons by 1962; **Showa Denko Company,** from 28,000 tons to 59,000; and **Sumitomo Chemical Company,** from 24,000 to 50,000 tons.

OCEANIA

REPUBLIC OF THE PHILIPPINES—**Philex Mining Corporation** treated 54,645 dry short tons of disseminated copper ore in November at its **Santa Tomas** plant, which began operations in 1958. Marketable metal for the month was an estimated 587,539 pounds of copper and 814,443 ounces of gold, with a gross market value of about Pesos 470,000. The previous month's recovery figures were 565,757 pounds of copper and 900 ounces of gold valued at Pesos 475,000.

QUEENSLAND—**Mining Corporation N. L.,** which has been drilling a number of deep holes in the Mount Isa vicinity, reports there seems to be no probability of developing a copper ore body, although some further work is being done. There seems little likelihood now that the **Mount Isa Mines Ltd.** ore bodies continue into **Mining Corporation N. L.'s**



Many large mills are equipped with Santa Fe Tanks and Pipe because they recognize our long experience in solving technical mining processing problems. Recent installations include thickener tanks up to 100' in diameter with Polyethylene tubing used for hoop and lug protection.

NO CORROSION . . . NO RUST

SANTA FE PRODUCTS INCLUDE:

- Thickener Tanks
- Solution Tanks
- Agitation Tanks
- Water Storage Tanks
- Conical Bottom Tanks
- Wood Flotation Cells
- Wood Precipitation Boxes
- Rectangular Tanks
- Wood Stave Pipe
- Wood Stave Flumes
- Wood Flume Stacks
- Wood Scrubber Towers

WRITE, CALL OR WIRE FOR:

WOOD TANK Bulletin B-145 and WOOD PIPE Bulletins P-56 and WP-100

Fluor PRODUCTS COMPANY

a division of
The FLUOR CORPORATION, Ltd.

Santa Fe Tanks

P. O. BOX 1267
SANTA ROSA, CALIFORNIA

areas. Mount Novit is not now considered a likely ore-producing area. **Mining Corporation N. L.** is controlled by **New Consolidated Goldfields Ltd. and Pan American Ventures Ltd.**

REPUBLIC OF THE PHILIPPINES—**Lepanto Consolidated Mining Company** treated 35,629 tons of ore, producing 3,688 tons of concentrates with about 2,222,300 pounds of copper and 3,552 ounces of gold (returnable gold at 3,481 ounces) during November. Average copper content of ore treated was 3.27 percent; average gold content, 0.134 ounce per ton. Copper recovery during the month was 95.4 percent and gold recovery, 74.6 percent.

FIJI ISLANDS—**Emperor Gold Mining Co. Ltd.** set a production record—75,990 ounces of gold recovered from 180,776 tons of ore—in the year ended June 30. Development is progressing and ore reserves increasing. Present measured underground figure is 862,000 tons, with indicated ore at 330,000 tons.

REPUBLIC OF THE PHILIPPINES—**Consolidated Mines Inc.** reportedly has signed a five-year contract with **Refractory Ores S.A.** of Panama for the sale of about $5,000,000 worth of chrome ore annually. The ore would come from the **Masinloc** mines in Zambales, operated by **Benguet Consolidated Inc.**

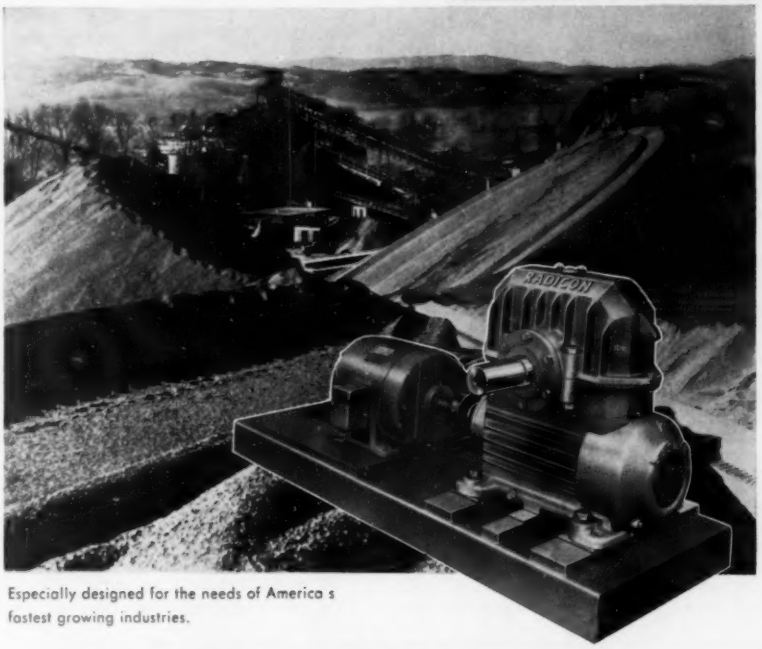
QUEENSLAND—Recent improvements in tin prices have also improved the outlook for **Tableland Tin N.L.** near Mount Garnet, and **Ravenshoe Tin Dredging Ltd.**, near Ravenshoe. Returns of 60 to 80 tons of concentrates per month enable reasonable profits, although yardage costs are high at about 20 to 24 pence. Australia is still short of tin, and, unless some incentive is provided by the Federal government, production must decline.

NEW ZEALAND—The cost of establishing an aluminum industry has been estimated at between £50,000,000 and £100,000,000. **Consolidated Zinc Corporation** is said to be negotiating with the New Zealand government regarding a £60,000,000 Stg. project in Southland, to use power from Lake Manapouri or Lake Te Anau. Under its agreement with the Queensland government, **Comalco** (Consolidated Zinc and **British Aluminum**) must establish a plant for treating Weipa bauxite in Queensland. Presumably, alumina could be smelted elsewhere as location in Papua has already been mentioned as a possibility. Bauxite has also been discovered in the North Island of New Zealand, near Auckland. The government has reserved the area for the present. It is not likely to be of great importance because of the Australian bauxite discoveries which are being vigorously developed.

UNION OF SOUTH AFRICA—Development at **Carrig Diamonds Ltd.** has discovered an unknown fissure at depth,

DAVID BROWN

at work around the world



Especially designed for the needs of America s fastest growing industries.

Just Position and Set Six Bolts...

the new RADICON COMPLETE DRIVES

"Eliminate drive design problems with the versatile new Radicon Complete Drive—just position—set six bolts and you're ready for service."

There's *no* do-it-yourself involved. Simply select the drive (easy as a gearmotor)—and set! Radicon reducers and motors are already carefully shimmed and aligned on heavy fabricated steel base plates of double box construction, firmly ribbed for rigidity. This means minimum stress at the flexible coupling—low maintenance, with complete versatility for service.

Fan-cooled Radicon Speed Reducers, such as type RHU in the above Complete Drive, are being specified for replacement and OEM in many industries these days. They have learned that Radicons are designed, not for show—but for rugged work in all extremes of temperature, dust, dirt and rain.

Immediate delivery 3" to 12", all standard ratios from 5:1 to 60:1. Radicon complete drives supplied by all authorized David Brown factory branches and distributors.

DAVID BROWN, INC.

999 Beecher Street, San Leandro, California
(TWX OA452U) (LOckhaven 9-7525)

6025 Atlantic Blvd., Maywood, Calif.
1224 S. W. Morrison St., Portland, Oregon

Gear Products for: Mines, paper and pulp mills, chemical plants, food processors... conveyors, hoists, agitators, screens, deckers, filters, canning machines, and other industrial equipment.

which may be a deep-seated extension of an ore body already mined. An extension of the lease area has been applied for to include the fissure. One shaft is being deepened to develop the deep zone. With completion of plant modifications and an improvement in mining conditions, diamond recovery and operating profit have been increased.

FEDERATION OF RHODESIA AND NYASALAND—**Bancroft Mines Ltd.** plans to sink a new twin-shaft system at an angle of 14° in relatively water-free beds. The main vertical shaft will not be deepened because of the possible danger of encountering heavy water flows. Mining from this shaft has been hampered by water and mud rushes. The inclines will be sunk to a vertical depth of 2,600 feet. Mine pumping of about 20,000,000 gallons per day has steadily lowered the water table, but with further sinking, additional pumping will be required. Intense folding and variations in dip of the ore beds has necessitated an increased footage of sub-level development beyond that planned. Fortunately, an unknown ore body has been discovered by this extra work in ground previously thought to be barren.

GHANA—A new diamond recovery mill at **Aninchecheche** was completed by **Consolidated African Selection Trust Ltd.** in June 1958 and has enabled the company to increase the amount of gravel treated to 725,000 cubic yards yielding a record production of 1,252,000 carats. The second part of the Aninchecheche mill will be brought into production in July 1960, and, in addition, steps will be taken to replace some of the old installations by one large centralized modern plant costing approximately £1,000,000.

UNION OF SOUTH AFRICA—First production of manganese ore has been made from the new mine on the farms Hotazel and York A. by **South African Manganese Ltd.** in the Kuruman district of northern Cape Province. A new railroad to the mine is due for immediate completion at which time truck haulage will be discontinued. The company will pay an additional freight charge between 10 and 20 shillings per ton until the new line has been amortized. ESCOM electric power will be made available to the mine and other mines in the area within a year so that lower mining costs will be possible.

MOROCCO—Morocco is withdrawing from the **Comptoir-Nord-African des Phosphates (North African Phosphates Association)** which produces in Tunisia and Algeria. Production of phosphates in Morocco has increased from 5,000,000 tons in 1955 to over 7,000,000 in 1958. The withdrawal decision will result in difficulties for the export of phosphates from Tunisia, which have a lower grade ore than Morocco. Phosphate production in Tunisia has remained at the same level, about 2,000,000 tons, for several years. After the withdrawal of Morocco the sale of Tunisian phosphates in the export markets will be restrained.

FEDERATION OF RHODESIA AND NYASALAND—**Roan Antelope Copper Mines Ltd.** is the first mine in Northern Rhodesia to have mined and milled over 100,000,000 tons of ore. The record was achieved in mid-November 1959.

UNION OF SOUTH AFRICA—**Allied Chemical Corporation,** New York, is acquiring 51 percent of **The Montrose Exploration Company Ltd.,** a United Kingdom company which owns chrome ore deposits and mines in the Transvaal. Shares will be held by Allied's wholly-owned South African subsidiary, **Allied Mining South Africa Ltd.** Allied Chemical, a leader producer of chromium chemicals in the United States, has a long-term contract with Montrose for its requirements of chrome ore.

UNION OF SOUTH AFRICA—**African Asbestos Cement Corporation Ltd.** has started a new exploration and development program at its **Lalkloof** chrysotile asbestos mine in order to increase reserves in new zones. A grading plant is being erected and is scheduled for early production.

SOUTH WEST AFRICA—**The United Steel Corporation** is reported to have started production from a new manganese mine.

FRENCH WEST AFRICA—An iron ore deposit has been discovered by the **French Overseas Mining Bureau** in the region of Kandi, north of Dahomey. The mineral reserves appear important, with the deposit extending for several dozen kilometers. However, the iron content appears fairly low. Also, the deposit is

AMERICAN ZINC, LEAD AND SMELTING COMPANY

Buyers of Zinc Concentrates Suitable for Smelting in Retort and Electrolytic Smelting Plants, also Buyers of High Grade Lead Concentrates.

Address Communications to Ore Buying Department

Paul Brown Building
ST. LOUIS, MISSOURI

423 Mills Bldg.
EL PASO, TEXAS

927 Old National Bank Building
SPOKANE, WASHINGTON

P.O. BOX 577
DUMAS, TEXAS

International Smelting and Refining Co.

ANACONDA
from mine to consumer

Buyers of

Copper, Silver & Gold Ores and Concentrates:

Copper Smelter—Miami, Arizona

Address: Ore Purchasing Department
International Smelting and Refining Co.
P. O. Box 1265
Miami, Arizona

Lead & Zinc Ores and Concentrates

Lead and Lead-Zinc Smelter
Lead-Zinc Concentrator
} Tooele, Utah

Address: Ore Purchasing Department

International Smelting and Refining Co.

818 Kearns Building
Salt Lake City, Utah

Please establish contact prior to shipment

located more than 600 kilometers from a shipping port. Because of these unfavorable aspects, the iron and steel research institute in France is seeking a suitable process for upgrading in order to permit commercial development.

FEDERATION OF RHODESIA & NYASALAND—Preliminary tests to find an economic method of extracting the copper from **Kansanshi** copper mine have proved disappointing because of the complex combination of oxide and sulphide ore. The company has decided, therefore, to incur the extra expense of a full pilot plant test program until the entire economic picture has been thoroughly examined and consideration given to alternative treatment processes. **Rhodesia-Katanga Company's** latest statement points out that the higher grade fractions of the oxide ore gave an acceptable rate of copper recovery, but when these were combined with the lower grade material which constitutes the bulk of the oxide ore reserve, recovery was much lower and technical problems arose. The mine is on a care and maintenance basis.

BECHUANALAND—**Marble Lime and Associated Industries'** subsidiary, **Marlime Chrysotile Asbestos Corporation,** is continuing prospecting and moderate development in manganese deposits of its 9,000-square-mile Crown Grant in the Bakgatla Reserve. A plant with a handling capacity of about 3,000 tons monthly is planned for installation at Kwa-kwe.

MANITOBA—A new shaft, with an initial depth of 2,000 feet, has been sunk at the **Lynn Lake** nickel-copper mines of **Sherritt Gordon, Ltd.,** where two double-drum hoists have just gone into service. The shaft will be extended within a few years to a depth of 4,100 feet and a further motor and generator set will then be added to the equipment.

BRITISH COLUMBIA—Preliminary development program on the 3,000-foot level is expected to be completed this month at **Craigmont Mines'** copper-iron property near Merritt. Satisfactory results have been reported from diamond drilling on the 3,500-foot and 3,000-foot levels. Engineering studies for further development are under way for the property which is a joint undertaking of **Canadian Explorations, Noranda Mines,** and **Peerless Oil and Gas Company.**

YUKON TERRITORY—An all-time high for silver production was reached during its fiscal year, by **United Keno Hill Mines** which reports a record of 7,300,000 ounces, up from the previous high of 5,900,000 ounces in 1958. High-grade ore from the **Elsa** mine, 28,002 tons averaging 79.05 ounces silver per ton, caused the production increase. Lead production was up, while zinc and cadmium output were slightly lower. Net profit was two and a quarter times that for the previous fiscal year. Development of the 18 vein on the 650 level of the **Calumet** mine and development of high-grade ore below the **Porcupine Fault** to the 650 level at the **Elsa** mine were of particular importance, according to F. M. **Connell,** president. The current year's plans call for continued exploration and development of **the Hector, Calumet** and **Elsa** mines on Galena Hill, and extension of the low level adit of **Galkeno** mine to the projected downward extension of the McLeod and Sime veins.

NEWFOUNDLAND—The new test plant of **Advocate Mines Ltd.** at Baie Verte, Newfoundland has produced over 200 tons of asbestos fiber which have been shipped to plants in the United States and Europe for further testing. Operations at the **Advocate** property on Burlington Peninsula, which has reserves estimated at 23,300,000 tons, include a surface drilling program and an underground exploration and development program as part of the overall evaluation. The test plant started production last October.

BRITISH COLUMBIA—**Camp McKinney Gold Mine Ltd.** has started shipments of silica and gold-bearing ore to the Trail, British Columbia, smelter of **Consolidated Mining and Smelting Company of Canada Ltd.,** which will take 50 tons of hand sorted ore daily. High-grade ore will be sacked and other ore shipped in bulk. The ore is estimated to contain 80 percent silica and will be used for fluxing purposes. **Giant Mascot Mines Ltd.** and **Mount Washington Copper**

Thoroughbreds
for your string!

SPANG
BLAST HOLE
BITS and
STEMS

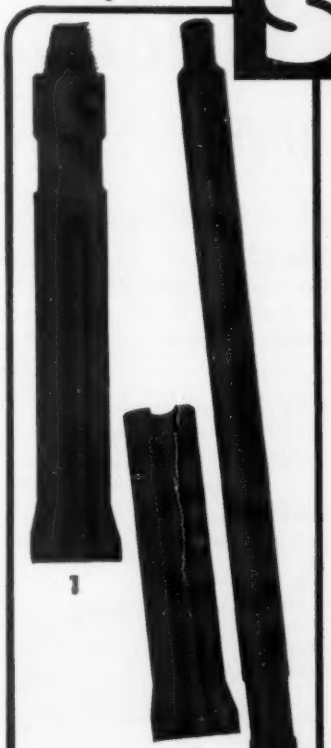
Sure winners in performance and production! Spang Bits and Stems, developed by skilled experts, are a safe bet to pace the field in long service and economy. Win, place or show you can be sure with Spang.

① SPANG CHURN DRILL BITS drill more holes per bit at lower cost! Fully heat-treated, high carbon, molloy steel, or 4340 steel. They have added strength in pin and blade sections to enable them to take the toughest drilling conditions in stride. Semi-dressed ends speed finish-dressing.

② SPANG REPLACEMENT BLADE SECTIONS are for welding to the pin and collar sections of the original bit when it has become worn from long service.

③ SPANG INTEGRAL ROPE SOCKET TYPE STEMS with heat treated swivel socket and swivel. Drill more . . . drill longer for less with these rugged, efficient stems. Made from one bar of steel with only a threaded box joint with integral rope socket top the stem's uniformity cuts vibration or whipping. Tools turn freely in the open swivel socket keeping the hole round and straight.

Your inquiries are welcome— contact your nearest Spang dealer or write direct to:

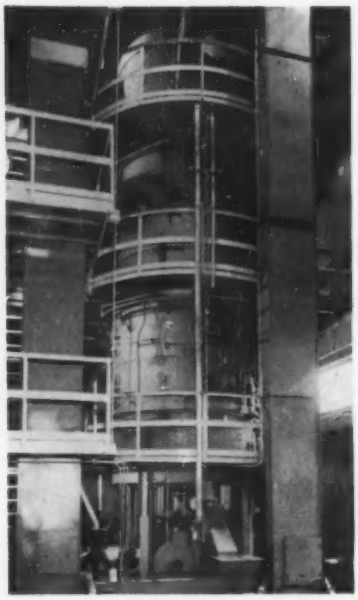


HIGHER STANDARD

SPANG & COMPANY

DEPT. M-7 BUTLER, PENNSYLVANIA

For over 60 years Manufacturers of Spang Weldless Jars and a Complete Line of Cable System Drilling and Fishing Tools for Oil and Gas Wells, Prospect Drilling and Shot Blast Holes.



If you have a Drying, Roasting, Calcining or Decomposing problem...

a Skinner Furnace

may be the answer

Successful applications of the Skinner Furnace include:

Oxidizing Roast

Roasting Molybdenum Sulphide Concentrates
Roasting Zinc Ores
Calcining of Basic Alum, Clays, Foundry Sand, Carbon, etc.
Incineration of Sewage

Chloridizing Roast

Roasting Uranium-Vanadium Ores

Reduction Roast

Decomposition of Oil Sludge
Lime Burning
Manganese Reduction

Drying

Drying Uranium-Oxide Precipitate
Drying Copper Concentrates
Dehydration of Alunite

Many other applications are possible ***because of the flexibility in construction and operation of the Skinner Furnace...***

2 to 14 hearths
4'0" to 23'6" dia.
22 to 4000 sq. ft. hearth area
Direct or indirect fired with coal, oil or gas
Variable rate of feed and retention time
Up or down draft
Handles any solids... slimy, sticky, loose, coarse
¾" to minus 325 mesh material
200° F. to 2000° F... precise control of process temperature
100 to 50,000 lbs. per hour

We are equipped to work with you on your problem...
...over 40 years experience

The Company that cares enough to give you the best!

WRITE TO MANUFACTURING DIVISION

MINE AND SMELTER SUPPLY CO.

Denver 16, 3800 Race St. | New York 17, 122 E. 42nd St. | Salt Lake City 1, 121 W. 2nd S. | El Paso, 1515 11th Ave. | Albuquerque, 701 Haines N.W.

LICENSED MANUFACTURERS AND SALES AGENTS in Canada, Australia, Sweden, England, South Africa

Sales Agents in Peru, Chile, Philippine Islands, Japan, New York City (for Continental Europe) and in principal cities of the U. S.

Mines Ltd. are part owners of Camp McKinney, where shaft sinking has given access to some 2,500 tons of ore averaging more than 1.0 ounce gold per ton.

QUEBEC—**Anacon Lead Mines** has resumed production at its **Chibougamau Explorers** gold-copper mine, 45 miles southwest of Chibougamau, after a five-month suspension to permit shaft deepening. During the shutdown the mill was also overhauled and rehabilitated, so that it will now have a capacity of up to 650 tons per day instead of the previous 550. The shaft was deepened to the 1,840-foot level and four new levels opened at 1,350, 1,500, 1,650, and 1,800.

ONTARIO—**Northspan Uranium Mines** has made good headway in its major underground development program to open up new ore in the **Lacnor** uranium mine in the Elliot Lake district. Crosscuts are already being driven on all three new levels from the Lacnor service shaft which has been deepened. The production shaft is also being deepened which, together with the service levels, will add nine new levels to the mine. A crusher station will be located at the production shaft and loading facilities and sump will be located beneath it. These are all in the process of being excavated.

QUEBEC—**Dumont Nickel Corporation** is drilling the molybdenite property of **Anglo American Molybdenite Corporation** in northwestern Quebec. The work on the 4,200-acre property is being paid for by Dumont who has promised to spend up to $75,000 on this program. Drilling actually is being done by **Berube Diamond Drilling Company** under contract.

BRITISH COLUMBIA—**Red Rock Mines** has cleaned out old tunnels at its silver-gold prospect in the Beaverdell-Wallace Mountain area and is planning a drilling program in the spring. J. A. Hallberg of Vancouver is president.

SWEDEN—A new iron ore concentration plant went into operation in January in Risbergsfaltet at the **Grangesberg** mine (**Stora Kopparsbergs Bergslaks AB**) where a head frame was placed in use in September.

WEST GERMANY—This country's first uranium processing plant began operations recently at Ellweiler in the Hunsruek Hills. Operated by **Gewerkschaft Brunhilde** of Hanover, the facility will be primarily a research project. It is not expected to operate very economically on locally mined ore, but will provide experience for future German plants. Imported uranium ore is considerably cheaper than any being processed. Estimated daily capacity is 50 tons of uranium-bearing ore, and yield has been calculated at about 2.2 pounds of uranium from one ton of ore.

EIRE—Progress at the **Mountain** mine of **Can-Erin Mines Ltd.** indicates a larger potential mining operation than was pre-

viously estimated. Ore lengths and widths being opened and drilled in and below the 1,200- and 1,350-foot levels are greater than shown for upper levels worked several years ago. The possibility now is that reserves of some 6,000,000 to 7,000,000 tons of 2 percent copper will be developed down to the 2,500-foot horizon. Earlier estimates were about 4,000,000 tons of potential reserves to this depth. Completion of recent work suggests that the three segments of the vein will have a total length of at least 1,000 feet, and an average width of 35 to 40 feet, with the probability that a grade of about 2 percent copper can be maintained. When the ore potential to the 2,500-foot level is proved, a new shaft will be needed to carry out development and mining below the 1,350-foot level. The company, of which **Mining Corporation of Ireland Ltd.** and **Emerald Isle Mining Company Ltd.** are subsidiaries, hopes to obtain government assistance.

BELGIUM—Presently available figures indicate that diamond production for the world during 1959 will probably be somewhat lower than in 1958, which was the ninth consecutive year of record production.

UNITED KINGDOM—At Swansea Vale Works, the **Imperial Smelting Corporation Ltd.** has put its new zinc and lead blast furnace into operation. The furnace which will produce 100 tons of zinc and 50 tons of lead per day, makes it possible to shut down the last horizontal furnace. Five more of the new large furnaces are under construction in all parts of the world. The company's No. 2 furnace at Avonmouth is now producing 70 tons of zinc and 30 tons of lead daily. Furnace efficiency has improved and coke consumption is less than originally estimated.

YUGOSLAVIA—Deposits of iron reportedly were discovered last year near Vardiste in southeast Bosnia, close to Visegrad. The ore contains some nickel and cobalt, as well as traces of copper and chromium. The deposit has about 35 percent iron content and plans call for it to be beneficiated on the spot. The mine is well situated with good possibilities for transportation, and erection of crushing plants is under consideration.

SWEDEN—Total Swedish exports of iron ore in 1959 were expected to reach 13,700,000 metric tons. Shipments abroad by **Luossavaara-Kiirunavaara AB (LKAB)** accounted for 12,500,000 tons, according to B. Lundholm of **Malmexport AB,** export organization of LKAB and the **Grangesberg** concern. Prospects for 1960 indicate a considerable expansion, he said, with contracts with Western Germany amounting to 7,200,000 tons and with Belgium, about 4,000,000 tons. LKAB expects to increase its mining capacity in northern Sweden to 21,000,000 tons annually by 1965.

AUSTRIA—Tungsten ingots weighing up to 900 pounds will be exported soon from Austria to the United States for use in rockets, missiles, and jet propulsion. Developed under the direction of Dr. Paul Schwarzkopf at the Metallwerk Plansee in Reutte, Tyrol, the ingots are made by a new process in which blocks are formed from tungsten powder in high-capacity presses, sintered indirectly in large, high-temperature furnaces, and then forged at high temperatures. There is an increased demand for parts made of tungsten, which melts at 6170° F., but previous methods, using direct sintering, were not feasible for producing parts with larger diameters and heights.

RUSSIA—Steel production in the Soviet Union in 1959 exceeded the target by 900,000 tons, totalling about 60,000,000 tons, according to the Soviet News Agency Tass. Output of pig iron—43,000,000 tons—and of rolled shapes—47,000,000 tons—also was above estimates.

YUGOSLAVIA—Latest methods of prospecting for uranium will be used here on decision of the **Federal Nuclear Committee.** Presently about 5,000 Geiger-Mueller counters made here are being used and helicopters are being obtained to continue airborne prospecting. Recently John Webb of the **International Nuclear Energy Commission** visited several mining and nuclear energy installations, including the uranium ore fields in the Stara Planina in Macedonia.

UNITED KINGDOM—**Skinningrove Iron Company Ltd.** of Yorkshire will start work soon on its new crushing, screening, and sintering plant for preparation of blast furnace ore. The new plant is part of a development scheme that will involve expenditure of about £1,000,000.

The Company that cares enough to give you the best!

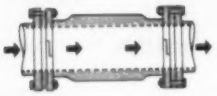
Massco-Grigsby

PINCH VALVES

RUBBER, NEOPRENE
for Corrosion and Abrasion

- 1" to 14" inside diameter.
- Pressures to 150 psi.
- Temperatures to 200° F.
- Patented "hinged" sleeve. Recesses serve as "hinges" during compression; reduce strain and permit tight closing.

- Cannot leak or stick.
- No working parts in contact with pulp or liquid; no packing glands.



- Unobstructed flow eliminates high friction loss.
- Remote control available.
- Can be equipped for automatic regulation.

- Split flanges and patented Flex Seal ends assure perfect seal.
- Closing mechanisms... manual handwheel; handwheel with chain and sprocket reduction unit; electric worm gear motor reducer; chain operated torque arm reducer; hydraulic; air-hydraulic.

WRITE FOR NEW CATALOG...

Manufacturing Division

MINE AND SMELTER SUPPLY CO.

3800 RACE STREET • DENVER, COLORADO
OFFICES AND AGENTS IN PRINCIPAL CITIES

SuperDuty DIAGONAL DECK No. 6 CONCENTRATOR TABLE

DEISTER DIAGONAL DECK OVERSTROM

Concentrate Minerals Sharply, Economically this Efficient Way

The SuperDuty® table offers mineral concentration at its best. Not only do you get highest grade concentrates and lean, lean tailings, but the volume of recirculated middlings is so reduced that you have room for many more tons of new feed per day while saving wear and tear on your circulating equipment

For convincing proof, send for Bulletin 118-C.

The Deister Concentrator Co., Inc.

The Original Deister Co., Incorporated 1906

925 Glasgow Ave., Fort Wayne, Indiana

15 SIZES OF PACIFIC® SCRAPERS

Model	Size	Weight
2A	26"	480 lb.
2A	30"	510 lb.
2A	34"	550 lb.
AB	36"	775 lb.
AB	42"	850 lb.
AB	48"	960 lb.
AB	54"	1080 lb.
3B	36"	1400 lb.
3B	42"	1540 lb.
3B	48"	1730 lb.
3C	60"	2590 lb.
3D	48"	2030 lb.
3D	60"	2865 lb.
3D	72"	3700 lb.
3D	84"	4000 lb.

U. S. A. Pat. No. 2716824 • Patented Canada 1957
Manufactured in Canada at Sorel, Quebec

Scrapers are a specialty with us. Write today regarding your scraping problems. Send for Bulletin No. 287 giving specifications, complete information.

Use Pacific Sheave Blocks, Sheave Anchors, "Round-The-Corner" Sheave Blocks, Jaw Crushers, Bit Knockers and Pacific Wearing Parts.

ALLOY STEEL & METALS CO.
1848 East 55th Street, Los Angeles 58, California
Mailing Address: Box 58323 Vernon Station
Los Angeles 58, California

1. A model and size to suit every mining system.
2. In service in practically every mining area throughout the world.
3. They stand up under the toughest service conditions.
4. They help you move more muck at less cost.

INTERNATIONAL

NORWAY—**Roeros Copperworks A.S.** has completed its aerial examination of the Roeros pyrite field and is now drilling on an ore body which was discovered during the survey.

YUGOSLAVIA—The mining enterprise **"KOSMAJ"** in the village of Babe, about 60 miles south of Belgrade, is developing pyrite deposits, mainly for export. A separation plant has been erected which includes crushers, washing machines, and a cup type retort concentrator which is being used in the country for the first time. The sulphur content of the pyrite is considered satisfactory for the production of sulphuric acid. Further geologic work in the district has also disclosed good quality galena ore with about 18 percent lead. This survey work is continuing.

SPAIN—**Sociedad Europa de Estudios y Gestion** is the name of a new company which has been formed with German and French backing to explore mines in Spain and North Africa. M. Beaujean is director of operations; E. H. Gruenert is consulting engineer.

YUGOSLAVIA—Poland and Yugoslavia have signed a $66,000,000 trade agreement for 1960. Poland will export industrial equipment, coal, coke, rolled products, chemicals, drugs, synthetic rubber, textiles, sugar, and household articles. In return, Yugoslavia will deliver concentrated zinc ore and pyrites, colored metals and products made of them, rolled products, cellulose, leather, synthetic fiber, and food products.

FOR TRULY

UNDISTURBED SAMPLES
FROM DIFFICULT FORMATIONS

ACKER-DENISON CORE BARRELS

THE ACKER-DENISON CORE BARREL PERFORMS WHERE OTHERS FAIL

The ability of the Acker-Denison Core Barrel to obtain undisturbed top quality cores from rare earths, ceramic clays, soft, but difficult formations accounts for its worldwide acceptance by mining and soils engineers.

ACKER-DENISON CORE BARREL —PROVED AND IMPROVED

While the basic features of the original Denison are duplicated in the samplers manufactured by Acker, numerous improvements suggested by Acker's 40 years of soil sampling experience are incorporated in the new Acker-Denison. It is these improvements that make the Acker-Denison even more useful and efficient than before!

Remember, no other manufacturer can offer the improved performance and exclusive patented features of Acker's new Denison Core Barrel. This proud achievement of Acker development and progress is exclusively Acker!

Write for Free Copy of Bulletin 1100. MW

ACKER DRILL CO., INC.
P. O. BOX 830 • SCRANTON 2, PA.

PORTABLE GANTRY

Has Both Height & Width Adjustment

With 6 ft. of height adjustment, and a wheel tread adjustable to the narrowest aisles, the result is a new concept in portable gantries. Also featured is an aluminum alloy I-beam to give easier handling, and increase safety by decreasing top heaviness. Also, the I-Beam hangs freely from hinged supports, thus eliminating internal twist and strain, regardless of how uneven the floor may be. The trolley is free to travel the full length of the beam. Both steel and aluminum I-beams available.

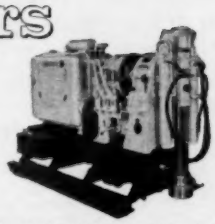
The legs fold against the I-Beam, resulting in compact unit for hauling, or in storage. Models are available in heights up to 17 ft. and 20 ft. spans, with maximum capacity being four tons. For complete literature write.

B. E. WALLACE PRODUCTS CO.
EXTON BB, PA. U.S.A.

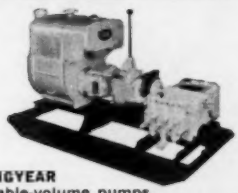
Longyear equipment saves exploration dollars

YOUR CREWS CARRY OUT drilling programs *faster* equipped with Longyear core drills. Longyear unitized drill rigs like this one slash moving and set-up time and increase operator efficiency. This Jeep rig consists of a powerful, gasoline-driven Longyear "24" diamond core drill, pump, and truss-type steel mast. Capacity is 675 feet with AW rods. Cab-over-engine Jeep and has 4-wheel drive able to move across roughest terrain.

ADV. 149



DRILL DEEP HOLES efficiently with a Longyear "44", a high-capacity drill throughout. The heavy duty planetary hoist has ample hoisting and braking power. NW twin hydraulic swivel head. Capacity: 3000 feet of AW rod. Skid or truck mounted.



LONGYEAR variable-volume pumps like this 5-speed 520RQ **help increase footage, bit life and core recovery.** The driller can instantly adjust volume and pressure over wide range ... and pump into a closed circuit at every stage.

Longyear

E. J. Longyear Company, Minneapolis 2, Minnesota
Canadian Longyear Ltd., North Bay, Ontario
Longyear et Cie, Paris • Longyear N. V., The Hague

A GOLD WASHING MACHINE

U.S. Govt. Patent No. 828-745

Thousands spent to develop, field test and patent

Send your name and address with $5.00 check or money order and receive promptly complete detail drawings, easy-to-follow instructions and material list that tell all you need to know about how to build this amazing compact gold recovery unit yourself. More gold with less effort from sand and gravel. Make $100 or more a day even with cheap gold prices. Just $5.00 will open the door to more profits than you ever dreamed possible. Have washed out as much as 2 oz. in an hour. No better machine on the market today. Can be built in any size. Pan can be amalgamated with mercury. Just the machine for Engineers, Geologists and Miners for field testing. Don't wait, order today. Build it next week. Will sell patent license to manufacturer on royalty bases.

F. R. Cheatham—Patentee
605 Dinwiddie St.
Lynchburg, Virginia, U.S.A.

If Your Income Depends On Mining You Need Mining World

Use the handy Subscription Card

LARGE SHOVELS-MILL-CONVEYORS

ROUND MOUNTAIN GOLD DREDGING CORP.

Plant at Round Mountain, Nevada

SHOVELS
1—7yd. Bucyrus Erie Shovel, 170B Electric
1—3yd. Bucyrus Erie 54-B, Diesel
1—3½yd. Marion, Model 111, with shovel and dragline attachment

CONVEYORS
1—60"x150' belt conveyor steel frame, complete with 100 HP West. gearmotor, 440V
1—42"x1250' Link Belt, conveyor steel frame 30' sections, 2-100 HP West. gearmotor 440 Volt
1—42"x625' Link Belt conveyor steel frame 55' stacking tower, 200 HP West. motor 440 Volt
1—36"x500' Link Belt conveyor steel frame complete with 100 HP Westinghouse Gearmotor, 440 Volt
1—36"x645' Link Belt conveyor steel frame 2-100 HP West. gearmotor, 440 Volt
1—36"x225' Link Belt conveyor steel frame 100 HP Westinghouse gearmotor, 440 Volt
1—42"x870' Link Belt stacking conveyor, steel frame, portable with Conveyco Mobile stacker 200 HP West. motor, 440 Volt
4—36"x50' approx. Link Belt steel frame conveyor, 7½ HP West. gearmotor, 440 Volt
1—42" Conveyor assemblies for 1800 ft. less belt. Some new
1—Lot 36" conveyor idlers
1—Lot, 30", 36", 42" Head & Tail pulleys, excellent

CRUSHER
1—36"x42" Birdsboro Buchanan, Jaw, 100 HP Westinghouse motor, 440 Volt available with portable steel frame.
2—2¼x3 Braun Chipmunk laboratory

HOPPER
1—Conveyco Truck dump station with 13'x20' grizzly hopper, tilting grizzly, 15'x15'x10' Hopper, 4'x8' recip. feeder, complete

CLASSIFIER
1—5'x25' Dorr DSFH, Rake, 5 HP motor

GEARMOTOR
2—100 HP West., 84 rpm, Falk Back stop, 440 V

GENERATOR
1—50 KW Caterpillar D-8800, 220/440 V, excellent

HOISTS
4—½ Ton Budgit, Electric 115 Volt
1—1 Ton P & H electric, 220/440 Volt 50' lift, excellent
1—1½ Ton Quick Lift, 220/440 Volt excellent
1—2 Ton Wright electric, 220/440 V, exc.

HYDROSEPARATOR
1—36'x10' Process Engineers, steel tank, 10 HP varidrive, 220/440 volt
2—24'x8' Process Engineers, steel tank, 7½ HP varidrive, 220/440 Volt

7 yd. Bucyrus Erie Shovel

JIGS
14—4 cell 42" Yuba jigs, Model M-8 complete with 3 HP drives
1—2 cell 42" Yuba jig, Model M-8

MILL
1—5'x10' Marcy ball mill, complete 100 HP motor 440 V, with controls

PUMPS
1—6"x8" Fairbanks Morse centrifugal, 2000 gpm, 300 HP, West. motor, magnetic drive & Regutron controls
1—14" Yuba Centrifugal 250 HP West. syn. motor, 440 volt
1—14" Yuba centrifugal 100 HP West. motor, 220/440 volt
1—16" Wintroath deepwell 2 stage, 2000 gpm, 100 HP syn. motor, magnetic drive and Regutron controls
3—6" Dorreo duplex diaphragm, model VM, 3 HP TEFC motor
2—8" Dorreo diaphragm, type W, 5 HP TEFC motor
3—6x6 Allis Chalmers sand, NRLOR 30 HP motor, 220/440 volt
2—16" Cascade sump pump, 7440 gpm, 30 HP, 440 V

SAND WHEELS
4—12½' x 4' Conveyco, duplex, steel tank, 2-20 HP West. gearmotor

SCREENS
1—9'dia. x 54½' Yuba Trommel heavy duty, 100 HP West. motor 440 Volt
4—4'x12' Tyler Ty-Rock, F-600, 10 HP Westinghouse motor

THICKENER
1—250' dia. x 14' -4½" Dorr traction mechanism, 2-7½ HP West. gearmotor

TRANSFORMERS
12—37½ KVA West. 2400/4160Y-240/480V
27—75 KVA West., 2400/4160Y-240/480V
3—250 KVA West. 2400 to 240/480V
1—529 KVA West. 5160 to 2400V
3—833 KVA West. 55,000 to 2400V

VULCANIZER
1—48" J. H. Heintz Vulcanizer
1—10" J. H. Heintz Vulcaniser

WEIGHTOMETER
1—36" Merrick Model E with automatic recorder

AT BUTTE, MONTANA

HOIST
1—135 HP Coeur d'Alene single drum mine hoist complete, 440 V, excellent

LOCOMOTIVE
1—1½ Ton Atlas, battery, 24" gauge complete with charger

LAMPS
25—Edison R4 Cap Lamps, with rack and charger

MOTOR
1—200 HP GE slip ring motor 1200 rpm 440 volt

CARS
22—20 cu. ft. Coeur d'Alene Mine ore cars, 24" gauge, excellent

HOIST, TUGGER
2—IR Model EU, air
2—IR Model EUA, air

MUCKING MACHINE
1—12B Eimco, 24" gauge

BLOWER
1—Series 1000 Joy Axivane, 10 HP
1—TM8 Coppus Ventair, 15 HP

DRILLS
3—Cleveland H-10AL sinker w/air leg
1—IR-JR 38 B jack drill

HEADFRAME
1—35' steel headframe, bolted construction

PHONE HU 4-7601 FOR COMPLETE LIST

MACHINERY CENTER INC.

1201 So. 6th West • P.O. Box 964 • Salt Lake City 10, Utah

1—Size 3GT2 IR Cent. Pump, 500 GPM, 500' TDH; 100 HP Motor.

1—Size 3UC1 Worth. Cent. Pump, 400 GPM, 646' TDH; 100 HP Motor.

1—4-Cell (28x28) D. E. Sub-A Flot. Machine.

2—18" x 24" Universal Rlr. Brg. Jaw Crushers.

1—3' x 8' Marcy E.P.D. Rod Mill.

1—5' x 9' Kennedy Ball Mill.

1—GD-9 Gardner-Denver Mucker, 18" Ga.

1—GD-10 Gardner-Denver Mucker, 24/18" Ga.

2—No. 12-B Eimco Muckers, 18/24" Ga.

2—No. 21 Eimco Muckers, 24/36" Ga.

1—No. 40 Eimco Mucker, 36/24" Ga.

1—6-Ton Goodman Battery Loco., 36" Ga.

2—8-Ton Atlas Battery Locos., 36" Ga.

MACHINERY RESERVE OF DENVER
730 West 42nd Ave., Denver 16, Colorado
Cable: "Marod" Phone: GL 5-9419

USED EUCLIDS AND PARTS FOR SALE, LEASE OR RENT

Model & Serial No.	Capacity	Location	Year Built
Euclid 40 TD 11558	22½ tons	Indianapolis, Ind.	1951
Euclid 49 FD 6129	15 tons	Hazelton, Pa.	1947
Euclid 49 FD 6395	15 tons	Hazelton, Pa.	1947
Euclid 49 FD 8984	Water Wagon	Indianapolis, Ind.	1947
Euclid 49 FD 7761	15 tons	Lancaster, Pa.	1948
Euclid 49 FD 8179	15 tons	Lancaster, Pa.	1948
Euclid 49 FD 10178	15 tons	Lancaster, Pa.	1951
Euclid 49 FD 10179	15 tons	Lancaster, Pa.	1951
Euclid 49 FD 10180	15 tons	Lancaster, Pa.	1951
Euclid 49 FD 6753	15 tons	Indianapolis, Ind.	1947
Euclid 49 FD 7471	15 tons	Indianapolis, Ind.	1948
Euclid 63 TDA 21201	22½ tons	Ogden, Utah	1957
Euclid 63 TDA 21709	22½ tons	Ogden, Utah	1957
Euclid 63 TDA 21216	22½ tons	Ogden, Utah	1957
Euclid 63 TDA 21708	22½ tons	Ogden, Utah	1957
Euclid 49 FD 10108	15 tons	Indianapolis, Ind.	1951
Euclid 49 FD 7245	15 tons	Indianapolis, Ind.	1948
Euclid 49 FD 7239	15 tons	Indianapolis, Ind.	1948
Euclid 23 FDT 4347	33 yd. Coal Hauler	Indianapolis, Ind.	1945
Euclid 23 FDT 4387	33 yd. Coal Hauler	Indianapolis, Ind.	1945
Euclid 46 TD 21544	22½ tons	Worcester, Mass.	1957
Euclid 46 TD 21545	22½ tons	Worcester, Mass.	1957
Euclid 46 TD 21303	22½ tons	Worcester, Mass.	1957
Euclid 20 TD 10583	22½ tons	Boise, Idaho	1950
Euclid 20 TD 10591	22½ tons	Boise, Idaho	1950
Euclid 20 TD 10830	22½ tons	Boise, Idaho	1950
Euclid 20 TD 10837	22½ tons	Boise, Idaho	1950
Euclid 20 TD 10581	22½ tons	Boise, Idaho	1950
Euclid 32 TD 11475	22½ tons	Boise, Idaho	1951
Euclid 20 TD 10582	22½ tons	Coeur d' Alene, Idaho	1950
Euclid 20 TD 10836	22½ tons	Coeur d' Alene, Idaho	1950
Euclid 20 TD 10588	22½ tons	Coeur d' Alene, Idaho	1950
Euclid 20 TD 10835	22½ tons	Coeur d' Alene, Idaho	1950
Dart 10 SUG 57037	10 ton Underground	Worcester, Mass.	1957
Dart 10 SUG 57038	10 ton Underground	Worcester, Mass.	1957
Dart 10 SUG 57051	10 ton Underground	Worcester, Mass.	1957
Dart 10 SUG 57052	10 ton Underground	Worcester, Mass.	1957

4—WD60 Koehring Dumpters Sacramento, California
2—Used 36 TD Boxes
3—Used FD Boxes

1—Northwest 80 D Combination Shovel, Dragline and Crane—Serial 18501
Located at Salt Lake City, Utah—1957 Machine

Mesaba Service & Supply Company
Hiway 169 East & Thirteenth Street
P.O. Box 121, Hibbing, Minnesota
Telephone AMherst 3-6831

MORSE BROS. – FIRST AND FOREMOST

CONCENTRATING TABLES
8—Dunham half size tables
9—Deister super-duty diagonal deck standard tables

CONCRETE MACHINES
1—Rex no. 160 pumpcrete machine
1—Bondactor machine model 750
1—Gunitor type E cement gun
3—Hackley concrete guns

DIESEL-ELECTRIC GENERATORS
1—15 KW Waukesha-Hesselman
1—30 KW Buda
1—75 KVA Caterpillar, D-13000
1—112½ KVA Caterpillar, D-17000
1—250 KVA Buda model 8D-CS-2505

GYRATORY CRUSHERS
1—1'8" Traylor type TY
1—Traylor type T Bulldog, 12" opening

AIR TUGGER HOISTS
1—Ingersoll-Rand Model DU
2—Ingersoll-Rand Model D&U
4—Ingersoll-Rand Model IH
1—Sullivan Model E-111
9—Ingersoll-Rand Model EUA
1—Ingersoll-Rand Model 10-H
8—Gardner-Denver Model HK
2—Joy "Turbinair" Model F-113
1—Sullivan Model L-111
2—Ingersoll-Rand Model 10HR
1—Sullivan Model HA 3
3—Ingersoll-Rand Model HU
14—Sullivan Model E-111 Air Slusher Hoists

AIR SLUSHER HOISTS
3—Ingersoll-Rand Model A-4NNOJ
1—Ingersoll-Rand Model HNNIJ
1—Sullivan Model FF-211
1—Sullivan Model F-212

ELECTRIC TUGGERS AND SLUSHERS
1—5 HP Sullivan, 2 drum slushers
1—5 HP Sullivan tugger
2—7½ HP Sullivan tuggers
1—15 HP Ingersoll-Rand size 15NN-IG, 2 drum slushers
1—30 HP Joy Double Drum Slusher
1—60 HP Sullivan 3 Drum Slusher
1—10 HP Sullivan A-312 3 Drum Electric Slusher
1—20 HP Sullivan AF-312 3 Drum Electric Slusher

BALL AND ROD MILLS
1—4' x 4' Marcy Ball Mill
1—6' x 4' Hardinge Conical Ball Mill
1—4½" x 4' Hirsch Ball Mill
1—64½ Marcy Ball Mill
1—8' x 22" Hardinge Conical Ball Mill
1—3' x 8' Morse New Rod Mill
1—5' x 10' Denver Ball Mill

JAW CRUSHERS
4—2¼" x 3½" New Morse Lab Crushers
3—4" x 6" New Morse Lab Crushers
1—5" x 6" New Morse Jaw Crusher
1—6" x 7½" Hendy Crusher
1—9" x 16" Eue-Ken No. 30 Crusher
1—10" x 20" Pacific Crusher
1—20" x 36" Diamond Roller Bearing, Steel Plate, Jaw Crusher

LOCOMOTIVES
2—1½ Ton Mancha "Trammers"
1—4 Ton Mancha Diesel Locomotive
3—5 Ton Atlas Battery Locomotives
2—5 Ton General Electric Battery Locomotives
1—4 Ton Westinghouse Battery Locomotive
1—4 Ton General Electric Trolley Locomotive
1—4 Ton General Electric Battery Locomotive
1—6 Ton Goodman Trolley Locomotive
1—6 Ton Jeffrey Trolley Locomotive
2—6 Ton General Electric Battery Locomotives
1—7 Ton Jeffrey Trolley Locomotive
1—7 Ton Atlas Battery Locomotive
2—8 Ton General Electric Battery Locomotives
3—8 Ton Ironton Battery Locomotives
1—9 Ton Whitcomb Battery Locomotive
4—10 Ton Atlas Battery Locomotives
2—10 Ton Jeffrey Trolley Locomotives
1—13 Ton Jeffrey Trolley Locomotive
1—13 Ton Goodman Trolley Locomotive
1—15 Ton Jeffrey Trolley Locomotive

MULTI-STAGE PUMPS
1—1½" Economy, 4 stage, 125 gpm, 300' head
1—2" American, 2 stage, 200 gpm, 180' head
1—2" Ingersoll-Rand, 2 stage, type 2MRV-40, 150-250 gpm, 325-500' head, 40 HP G.E. motor
1—2" Union, 6 stage, 150-220 gpm, 510-590' head
1—2" Hill, 4 stage, 75 gpm, 350' head
1—2" Byron-Jackson, 2 stage, 125 gpm, 125' head
4—2½" Pennsylvania, 4 stage, 140-200 gpm, 400-570' head
1—2½" Pennsylvania, 6 stage, 150 gpm, 640' head
1—2½" Buffalo, 4 stage, 250 gpm, 440' head
1—3" Worthington, 2 stage, 500 gpm, 550' head with 100 HP G.E. motor
1—3" Allis-Chalmers, 3 stage, 400 gpm, 250' head
1—3" Hill, 3 stage, 250 gpm, 200' head
1—3" Buffalo, 4 stage, 250 gpm, 600' head
2—3" United, 5 stage, 110-350 gpm, 550-600' head
2—3" Union, 6 stage, 260-350 gpm, 630-700' head
3—3" United, 6 stage, 180-350 gpm, 700-900' head
1—4" Platt, 2 stage, 250 gpm, 110' head
1—4" Ingersoll-Rand, 2 stage, type 4GT2, 1000 gpm, 920' head with 300 HP G.E. motor
1—5" Manistee, 8 stage, 450 gpm, 865' head
1—6" Byron-Jackson, 3 stage, 1000 gpm, 1592' head with 500 HP G.E. motor

WHEN YOU BUY FROM MORSE BROS. YOU ARE DEALING WITH THE LARGEST, OLDEST AND MOST RELIABLE DEALER AND REBUILDER OF USED MINING AND MILLING MACHINERY IN THE COUNTRY.
Send for 52 page illustrated reconditioned machinery catalog No. 591-M.

MORSE BROS. MACHINERY COMPANY

2900 Brighton Blvd. KEystone 4-5261 **Denver 1, Colorado**

W. R. WADE

CONSULTING MINING ENGINEER

ANOTHER WADE COPPER MILL
(Now operating)
UNDER CONSTRUCTION
IN
CUBA

30 year experience
Designing and Building
Copper, Lead, Zinc, Gold Mills

W. R. WADE
Marysville, Montana
Cable Wade Helena
Tel. Helena Hickory 2-0105

FEDERAL PIPE & TANK CO.

WOOD PIPE and WOOD TANKS

Ore Bins
Tailings Pipe

6851 E. Marginal Way
Seattle 8, Wash.

MINING TIMBERS

ALL GRADES—ALL SIZES

Direct Mill Shipments
By Truck & Trailer or Rail

Phone or write for
Details & Prices

MOTHER LODE LUMBER
P.O. BOX 308
GEORGETOWN, CALIF.
FEderal-3-4336

CORE DRILLS, Auger Drills, Hand Soil Testing Drills, Well Drills. New and used equipment at money saving prices. Everything in supplies. Send for bulletins. Pressey & Son, Pueblo, Colo.

FOR SALE

MILLS CRUSHERS
1—Kennedy 7' x 9' ball mill, 150 HP
3—Hardinge 8' x 36" conical ball, 150 HP
1—Al.-Ch compeb 7' x 24", 400 HP
1—Hardinge 4' 6" x 16" Conical Ball
1—Marcy Rod, 7' x 15', 4" liners, 300 HP.
1—Kennedy 4' x 8' rod, 50 HP, EPD
2—Al.-Ch. Ball-tube, 5' x 22', 6' x 16".
3—Jaw Crushers, 36" x 15", 20" x 6", 18" x 9"
1—Hammermill, Penna. Crusher 400 HP, non-clog, #5060, UNUSED.
1—Gyratory Crusher: Kennedy #49, 100 HP.
3—Raymond roller Mills: #5057, #6058

DRYERS, KILNS
9—Rotary kilns: 11' x 10' x 175', 11' x 155', 10' x 160', 10' x 78', 8' x 125', 6' x 7' x 100', 7'6" x 100', 7'6" x 60', 8'8" x 70'.
20—Rotary hot air dryers: 8'8" x 70', 7' x 50', 6' x 50', 5'6" x 50', 5'6" x 32', 4'8" x 40,, 4'6" x 32', 4' x 30', 3' x 15'.

PERRY EQUIPMENT CORP.
1429 N. 6th St. Phila. 22, Pa.
POplar 3-3505

FOR SALE—GOOD CONDITION

Two 1955 dumptracks—one Reo and one Cook Bros. J664 Loadking—both with 10-wheel tandem drive, 5-speed transmission, 10 yard capacity ..... $4500.00 each

One D4 Caterpillar Diesel standard tractor with standard Trackson skip loader attachment $2000.00

UNION GYPSUM COMPANY
1414 E. Hadley ALpine 8-6106
Phoenix, Arizona

Index of Advertisers In Mining World

** Asterisk indicates firms whose products are catalogued in* MINING WORLD's *1959 Catalog, Survey & Directory Number*

A

★Acker Drill Company, Inc. 76
Allmak Corporation 12
Allis-Chalmers 18
★Alloy Steel & Metals Co. 76
★American Cyanamid Co. .. 51
American Manganese Steel Division 22-23
★American Smelting & Refining Co. 17
★American Zinc Sales 72
★Atlas Copco 1

B

★Baldwin-Lima-Hamilton Corp. 4
★Boyles Bros. Drilling Co. 58
★Brown, David, Inc. 71
★Bunker Hill Co. 56

C

Caterpillar Tractor Co. 10-11, 66
Cheatham, Frank R. 77
★Colorado Fuel & Iron Corp. 16

D

★Deister Concentrator Co. Inc. 75
★Denver Fire Clay Co. Inside Back Cover
★Dorr-Oliver Inc. 26-27
★DuPont de Nemours & Co., E. I. 67

E

Equipment Engineers, Inc. 20
★Euclid Division, General Motors Corp. .. 28

F

★Fluor Products Co. 70

G

★Gardner-Denver Co. 24
★General Motors Corp., Euclid Div. 28
★Getman Brothers 63
Gripholst, Inc. 77

H

★Harnischfeger Corp. 6-7

I

★International Harvester Co. 2, 14-15
★International Smelting & Refining Co. 72

J

★Joy Mfg. Co. 3, 64

K

★Knapsack-Griesheim, A.G. 8

L

★LeTourneau-Westinghouse Co. 19, 21
Longyear Company, E. J. 77

M

★Magma Copper Co. 56
★Mine & Smelter Co. 74, 75

N

★National Malleable & Steel Castings Co. 13
★Nordberg Mfg. Co. 25

S

Sanford-Day Iron Works Inc. 54
★Spang & Company 73

T

★Traylor Engineering & Mfg. Co. 55
★Tyler Co., W. S. 52

W

Wallace Products Co., B. E. 76
★Western-Knapp Engineering Co. ..... Inside Front Cover
★Wild Heerbrugg Instruments, Inc. 69
★Wilfley & Sons, Inc., A. R. Outside Back Cover

THE MARKET PLACE

★Federal Pipe & Tank Co. .. 79
Machinery Center, Inc. 78
Machinery Reserve of Denver 78
Mesaba Service & Supply Co. 78
Morse Bros. Machinery Co. 79
Mother Lode Lumber Sales 79
Perry Equipment Corp. 79
★Pressey & Son, S. W. 79
Smith, Paul F. 80
Union Gypsum Co. 79
★Wade, W. R. 79
Windeler Co., Ltd., George 80

PROFESSIONAL DIRECTORY

★Alexander, John L. 65
★Arizona Testing Laboratories 65
★Bennetts Chemical Laboratory, Inc. 65
Burbridge-Pyburn 65
★Cannon Associates, Harry B. 64
★Chapman, Wood & Griswold 65
★Colorado Assaying Co. ... 65
★Cooke, Everett & Associates 64
★Cowin & Co. 65
★Diamond Drill Contracting Co. 65
★Dickinson Laboratories, Inc. 65
★Goodall Brothers 65
Hanks Inc., Abbot A. 64
★Keegel, C. P. 65
★Kellogg Exploration Co. .. 65
★Longyear Co., E. J. 64
Lottridge-Thomas & Assoc. 65
★McClintock Co., R. S. ... 65
Mesabi Engineering 65
★O'Donnell & Schmidt 65
★Reed Engineering 64
★Rice, Neil A. 65
★Still & Still 65
★Thurman, C. H. and F. M. Blanchard 65
★Turner & Associates 65
Vaughan Diamond Drilling 65
★Whalen, J. F. 65
★Wisser & Cox 65
★Wood Assaying Co., Henry E. 65

CLASSIFIED ADVERTISING

MINING EDITOR WANTED

Prominent mining journal has need for a man 35 or under, with good mining, metallurgical, or geological background. Position requires technical writing ability. Good personality and public relations ability important. Excellent starting salary with opportunity for steady advancement. Also fully paid expense travel. Position involves work of unusual interest and opportunity for the right man. West Coast location. Write or wire Box B-2, Mining World, 500 Howard Street, San Francisco 5, California.

FOR SALE: Angeline mine in Mexico, containing high grade ores of silver, lead and copper sulfides. Good production record. Ill health forces owner to halt operations. Contact: Francisco Baldor B., Hidalgo #56, Matehuala, S. L. P., Mexico.

HAVE NEW GOLD MILL: You furnish ore—we'll furnish milling. Ten-ton amalgamation mill for free milling ores to mill your ores, dumps, tailings on production or flow-sheet pilot operation. Can furnish larger or whatever mill operations will require. Can lease and mine and mill also. If you can furnish Gold ores for milling or have ores to lease, send full information to: Gold Co-op, P. O. Box 1571, Las Vegas, Nevada.

FOR SALE: 320 acres land in southern Idaho, should be prospected. Reported to contain gold, uranium, iron and coal. Write P. O. Box 394, Lewistown, Montana.

FOR SALE: Joy 22 HD Drill Rig in superb condition—drilled only 8,500', mounted on GMC truck with 4,000 actual miles; all machinery bought new; can drill over 1,000' deep; will send details; terms available. Write Hamlin Mining Co., Midwest, Wyoming.

MECHANICAL/ELECTRICAL SUPERINTENDENT: Master mechanic desires responsible position. Twenty years supervisory experience in all phases mechanical-electrical maintenance of open pit, underground and plant equipment, power plant operation and maintenance. One of the originators of Preventive Maintenance of mining equipment. Domestic or foreign employment acceptable, available on 30 days notice. Write Box B-1, Mining World, 500 Howard Street, San Francisco 5, California.

WOOD TANKS
for Every Purpose
Since 1885

Pipe
Cooling Towers
And Engineered Wood Products
GEORGE WINDELER CO. Ltd.
2229 Jerrold Ave., VAlencia 4-1841
SAN FRANCISCO 24, CALIFORNIA

Apron Feeder: Pioneer 36" x 8 ft. with 5 hp variable speed gearmotor.
Crusher: 15x30 Buchanan Blake Type
Portable Crushing Plant: Cedar Rapids 20x36 rlr-brg jaw crusher, etc.
Triple Roll Crusher: Pioneer 30x18 with 100 hp slipring motor. Like new
Rod Mill: 4x10 Hardinge periph. end discharge
Rod Mill: 2x10 Marcy with new liners
Ball Mill: 5 ft. dia. x 4 ft. Hendy grate dis.
Flotation: Denver 32, 28, 24 & 22" cells, and Wemco Fag 44" cells.
Filters: 2 Eimco 3-Leaf 6 ft. acid resistant

Paul F. Smith
39 W. Adams St. Phoenix, Arizona

To Gain Knowledge What Your Mineral Deposit Is Worth Means Forming Capital
Dr. Grad MINING GEOLOGIST German 59 worldwide experience—acquainted with Latin America
Desires independent position of trust
(Record of leading mining companies)
Qualified for planning fast field prospecting programs
Experienced in open pit heavy equipment, shaft sinking, fast development, underground operations, mechanical accessories
Well versed for years with Mine Management and Reorganizations Problems
Write to Box A-1, Mining World, 500 Howard Street, San Francisco 5, California

Dependable testing equipment

for 83 years...

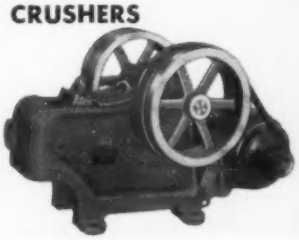
Melting, refining, processing, production—all begin with accurate, uniform *testing*. Denver Fire Clay products and equipment have been serving the testing field for 83 years, efficiently and economically—and this is your assurance of accurate, trouble-free testing year after year after year.

Write for full information about any of the products on this page. Other DFC quality products include fire brick and special shapes, refractory specialties, industrial furnaces, burners, and incinerators.

DFC LABORATORY CRUSHERS

Fast — Rugged — Economical

For reducing ore, rock, or brittle substances from 2½ to ¼ inches in diameter or smaller, at rates of 50 to 150 pounds per hour.



DFC ELECTRIC ASSAY FURNACES

Accurate — Dependable

Rugged open-hearth-type furnaces, designed and built for accurate, uniform assays, and greatest return on your money. Fast-heating, U-shaped, nickel-chrome heating elements are supported in specially designed refractory blocks—insure maximum heat reflection. Furnace lining is backed with high and low-temperature insulating brick. Entire unit is encased in welded steel jacket. Wide doors provide easy access to crucibles. Indicating-controlling-type pyrometer insures absolute, constant control of temperature and atmospheric condition for cupeling.

Available in two models which offer a choice of automatic or manual control. Capacity: thirty-five 20-gram or twenty-four 30-gram crucibles. Also gas and oil-fired assay furnaces.

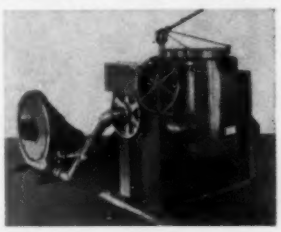
DFC METALLURGICAL CLAY GOODS

DFC Clay Goods—crucibles, annealing cups, muffles, trays, roasting dishes, scorifiers and ignition dishes—are world renowned for quality and dependability.

DFC CRUCIBLE MELTING FURNACES

Fast — Efficient

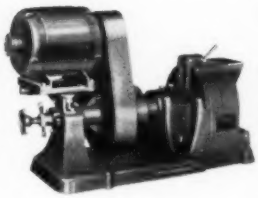
Designed for continuous operation to 2200° F., and extensively used for melting gold, silver, cyanide precipitates, brass, and other non-ferrous metals. Stationary types are available in seven models, to accommodate seventeen crucible sizes, ranging from #30 (282-cubic-inch capacity) to #400 (3,765-cubic-inch capacity). Manual tilting types are also available in seven models, to accommodate sixteen crucible sizes, ranging from #40 (377-cubic-inch capacity) to #400.



Burner systems are adaptable to gas or oil-firing. Design simplicity insures easy maintenance.

DFC PULVERIZERS

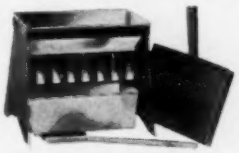
Disc-Type — Direct Drive



Perfect companions to DFC Crushers. Medium quartz ore can be reduced from ¼ mesh size to 100 mesh at the rate of 1.4 pounds per minute. Any degree of fineness up to 120 mesh is obtained by turning a hand size-wheel at the rear of the machine, and a lock nut holds any adjustment.

SAMPLERS

Available in sizes from 5 by 4½ inches to 18 by 10½ inches hopper-top. Jones Pattern Samplers also available.



DENVER FIRE CLAY COMPANY
3303 Blake Street, Denver, Colorado

Please send literature on:

FIRM_____

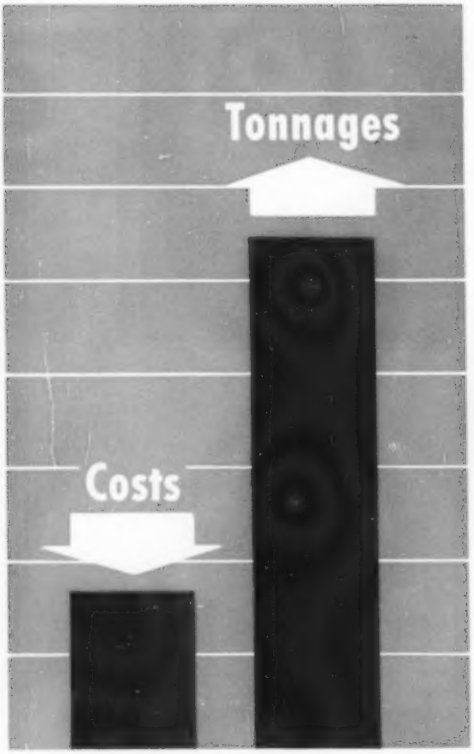
ORDERED BY_____ TITLE_____

ADDRESS_____

DF 9-9

Denver Fire Clay Company

DENVER • SALT LAKE CITY



Lower Pumping Costs...Higher Tonnages

Wilfley's versatile line of sand pumps give you economy plus increased output. If you require belt-driven, overhead V-belt driven, or direct driven pumps, Wilfley has them —available in 1″, 1½″, 2″, 2½″, 3″, 4″, 5″, 6″, 8″ and 10″ discharge sizes. They may be fitted with interchangeable electric furnace alloy iron, special application alloys or rubber-covered wear parts.

Put a Wilfley Sand Pump to work—it guarantees continuous, maintenance-free service, stepped-up production, longer pump life, and quick, easy replacement of parts.

Every Installation Job Engineered for Maximum Pumping Economy.

Write, wire or phone for complete details.

A. R. WILFLEY and SONS, INC.

DENVER, COLORADO, U. S. A. • P. O. BOX 2330

NEW YORK OFFICE: 122 EAST 42nd STREET, NEW YORK CITY 17

WILFLEY

SAND PUMPS